Spectra Tape Libraries

SCSI Developer's Guide

Part Number

90940001 Revision G

Revision History

Revision	Date	Description
E	September 2005	
F	October 2009	Updated to encompass all tape libraries that return SPECTRA PYTHON in the Inquiry string. Removed unsupported Extended Copy and Receive Copy Results commands.
G	April 2015	Update commands for new features. Add READ BUFFER command. Update trademarks.

> **Note:** To make sure you have the most current version of this guide check the Spectra Logic website at support.spectralogic.com/documentation. To make sure you have the release notes for the most current version of the BlueScale software, log into the Spectra Logic Technical Support portal at support.spectralogic.com. The release notes contain updates to the *User Guide* since the last time it was revised.

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Spectra Tape LibrariesContents

ABOUT THIS GUIDE

This manual provides reference information for developing SCSI applications for use with a Spectra tape library (referred to as the *library*). Each logical library (partition) defined within a physical library uses the same SCSI communication protocol as the physical library.

> **Note:** The SCSI operations performed by the library are separate from the SCSI operations performed by the enclosed drives. For drive SCSI operations, refer to the appropriate drive documentation.

CONTENTS OF THIS MANUAL

This manual contains the following information:

- Chapter 1 – Overview of the Library as a SCSI Device, beginning on page 12 provides a general overview of the library as a SCSI device, including descriptions of the elements in the library, the SCSI command format, and definitions of the status byte returned by the library in response to SCSI commands.

- Chapter 2 – Initialize Element Status (07h), beginning on page 16 through Chapter 16 – Test Unit Ready (00h), beginning on page 94 contain information about individual SCSI commands. For ease of reference, the commands are presented in alphabetical order.

- Appendix A lists the sense keys, ASCs (Additional Sense Codes), and ASCQs (Additional Sense Code Qualifiers) returned by the library in response to a **REQUEST SENSE** command.

RELATED PUBLICATIONS

For additional information about the Spectra tape libraries, refer to the following publications.

Spectra Tape Libraries

The most current version of this guide and the following documents related to the Spectra tape libraries are available on the Spectra Logic website at support.spectralogic.com/documentation.

- The *User Guide* for each library describes the configuration and operation of the library.

- The *Release Notes and Documentation Updates* for each library provides the most up-to-date information about the library, drives, and media.

LTO Ultrium Tape Drives

The following documents provide information that is applicable to all IBM LTO tape drives.

- *IBM Tape Device Drivers Installation and User's Guide*

    Note: This guide also provides information about using the IBM Tape Diagnostic Tool (ITDT) to troubleshoot drive problems.

- *IBM TotalStorage LTO Ultrium Tape Drive: SCSI Reference* (LTO-1 through LTO-4)

- *IBM TotalStorage LTO Ultrium Tape Drive: SCSI Reference* (LTO-5 and LTO-6)

For drive-specific information, search for the product name (for example, LTO 5) on the documentation page on the IBM website. You can also search the IBM Support Portal at http://www-947.ibm.com/support/entry/portal/Documentation.

TS11x0 Technology Drives

The following documents provide information that is applicable to TS11x0 technology drives.

- *IBM Operator Guide 3592 Models J1A, E05, E06, EU6, J70 and C06 at* http://publibfp.dhe.ibm.com/epubs/pdf/a86opg02.pdf

- *IBM System Storage Tape Drive 3592 SCSI Reference* at https://www-304.ibm.com/support/docview.wss?uid=ssg1S7003248

- *IBM Tape Device Drivers Installation and User's Guide* at https://www-304.ibm.com/support/ docview.wss?rs=577&uid=ssg1S7002972

    Note: This guide also provides information about using the IBM Tape Diagnostic Tool (ITDT) to troubleshoot drive problems.

Standards

- *Small Computer System Interface — 3 (SCSI-3)*
- *SCSI Primary Commands—3 (SPC-3)*, Revision 23
- *SCSI Media Changer Commands — 2 (SMC-2)*, Revision 7
- *SCSI Stream Command Set — 2 (SSC-2)*, Revision
- *SCSI Stream Command Set — 3 (SSC-3)*, Revision

Typographical Conventions

This document uses the following conventions to highlight important information:

Note: Read text marked with "Note" for additional information or suggestions about the current topic.

⚠ **Important** Read text marked by the "Important" icon for information that will help you complete a procedure or avoid extra steps.

⚠ **Caution** Read text marked by the "Caution" icon for information you must know to avoid damaging the library, the tape drives, or losing data.

⚠ **WARNING** Read text marked by the "Warning" icon for information you must know to avoid personal injury.

CHAPTER 1

Overview of the Library as a SCSI Device

This chapter provides background information for understanding how a tape library operates as a SCSI device.

SCSI DEVICE RELATIONSHIPS

The Small Computer System Interface (SCSI) is a standard that enables a host computer and peripheral equipment, such as the library and its tape drives, to communicate. The library and the tape drives each support an independent set of SCSI commands. When a library is divided into multiple partitions using Shared Library Services (SLS), each partition is treated as an independent logical library.

The physical components of the SCSI system consist of the following:

- **Initiator** A computer equipped with a host bus adapter card which allows it to send commands, messages, and data across the bus to targets such as the library or tape drives. The initiator can also receive data, messages, and status from the targets.

- **Targets** Devices capable of receiving commands from an initiator. The library and tape drives are independent targets. The library is the target for cartridge inventory and movement operations. The tape drives are the targets for read and write operations.

- **Bus** The cables that connect the initiator to the library, tape drives, host bus adaptor (HBA), and other devices form the bus and provide a pathway for passing information between the initiator and the targets. Each device attached to a bus has a unique ID that identifies it during communication.

ELEMENTS AND ELEMENT ADDRESSES

Each element in the library has a unique element address. When you issue SCSI commands to the library, you may need to specify an *element address* to identify a specific location (called an *element*) for which the particular command is intended.

The library contains the following types of elements:

- **Medium transport element** The robot (transporter) is the medium transport element that moves the cartridges in the library. Although some of the tape libraries may contain more than one robotic element, the multiple robotic elements cannot be addressed individually; the robotic movement logic for multiple robots is handled internal to the library. Therefore, there is only one robotic element address for Spectra tape libraries.

- **Storage elements** The cartridge slots in the partition's storage pool are the storage elements. These elements store the cartridges while they are not being used in the tape drives.

- **Import/export element** The import/export elements let you import media into or export media from the partition's storage pool.

  - With the exception of the T120 and T50e libraries, the import/export elements in the tape libraries are the slots assigned to the entry/exit pool for a partition. Since the number of entry/exit chambers in a partition is configurable, there is no set number of import/export elements.

  - For the T120 and T50e libraries, the import/export elements are the slots in the entry/exit port. In these libraries the import/export elements are fixed elements that cannot be altered or changed. Although, to support more than one partition, logical representations of the import/export elements can be configured. See Overview of T120 and T50e Entry/Exit Modes on page 73 for more information.

- **Data transfer elements** Each tape drive is a data transfer element, a source or destination for tape cartridges moves, for data reads and writes. Each tape drive has its own ID and responds to tape drive-specific SCSI commands.

SCSI COMMAND FORMAT

The library uses six-, ten-, and twelve-byte commands, whose formats are described in the SCSI-3 standard. Any SCSI command descriptor block (CDB) fields that are specific to the library for a given command are described in the chapter specific to that command.

Any errors caused by illegal parameters in a CDB or parameter list for a particular command are listed at the end of the chapter specific to that command. Errors of this type return a sense key of Illegal Request (5h).

Table 1-1 lists the CDB fields that are common to every command.

Table 1-1: Definitions of CDB Field common to all commands

Field	Description
Logical Unit Number (LUN) Field	The library is a single device target and only supports a LUN of 0. The LUN field for each CDB must be set to 0. **Note:** If the Identify message is sent before the CDB, the LUN field in the CDB is ignored. However, the LUN field in the Identify message must be set to 0.
Reserved Fields	The word *Reserved* in a field definition for a SCSI command refers to fields defined as reserved by the SCSI-3 standard. The library checks these fields for a value of 0. If a 0 is not present, the library returns Check Condition status with a sense key of Illegal Request (5h).
Obsolete Fields	The word *Obsolete* in a field definition for a SCSI command refers to a field that was defined in a previous SCSI standard but has been removed from the current SCSI standard. The library ignores any value in these fields.
Control Byte	The vendor unique portion of the Control byte (as indicated in the SCSI-3 standard) is defined for each specific command, if used. The library does not support linked commands or recognize the Flag bit.

SCSI COMMAND STATUS BYTES

The library sends one status byte to the initiator in response to each command. Table 1-2 summarizes the status bytes used by the library.

Table 1-2: SCSI command status bytes supported by the library

Status	Hex Value	Description
Good	00h	Indicates that the library successfully completed the operation specified by the CDB. The library returns Good status to indicate that the operation specified by the CDB completed normally.
Check Condition	02h	Indicates an error, exception, or abnormal condition that has caused sense information to be set. The library returns Check Condition status to indicate that an error occurred while it was executing a command. The library reports Check Condition status as soon as it detects the error unless it is disconnected from the SCSI bus. If the library is disconnected, it reports Check Condition status after the reconnect process. For specific situations that return Check Condition status, refer to the command descriptions in Chapter 2 – Initialize Element Status (07h), beginning on page 16 through Chapter 16 – Test Unit Ready (00h), beginning on page 94.
Busy	08h	Indicates that the library is unable to accept a command from an initiator. The library returns Busy status to any initiator that sends a command other than **INQUIRY** or **REQUEST SENSE** when the library is disconnected from the SCSI bus or when it is waiting for a SCSI motion process to abort. If allowed, the library disconnects from the SCSI bus when performing any lengthy operations, such as a move operation. The library cannot abort a motion process until the full motion recovery operation completes. The library reports BUSY and cannot process commands other than **INQUIRY** and **REQUEST SENSE** until recovery completes.
Reservation Conflict	18h	Indicates that the elements or the library identified in the command are reserved by another initiator. The library returns Reservation Conflict status to indicate that either the entire library or the elements requested to be accessed are currently reserved by another initiator. This status is reported until the initiator that reserved the library or elements issues a **RELEASE** (17h) command or a reset condition occurs. The library does not support Persistent Reservations (SPC-3).

Initialize Element Status (07h)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (07h)							
01	Obsolete [a]				Reserved			
02	Reserved							
03								
04								
05	Control							

a. These bits are ignored.

ABOUT THIS COMMAND

The **INITIALIZE ELEMENT STATUS** command does not do anything. The inventory is already known. For the T50e and T120, the inventory is scanned during initialization; for the T200, T380, T680, T950, and TFinity, the inventory is stored in nonvolatile cache. The library automatically updates the element inventory each time the TeraPack Access Port (TAP) or entry/exit port is opened and closed or whenever the library robotics moves media from one element to another. The inventory information can be returned to the initiator using the **READ ELEMENT STATUS** (B8h) command (see Chapter 10 – Read Element Status (B8h), beginning on page 53).

COMMAND RESPONSE

The library returns a status bit in response to the **INITIALIZE ELEMENT STATUS** command. No data is returned.

COMMAND STATUS

The library returns a status byte after processing the **INITIALIZE ELEMENT STATUS** command as follows:

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 14 – Reserve (16h), beginning on page 88 for more information about the **RESERVE** command.

Check Condition

Check Condition status is returned for the following reasons:

- A Unit Attention condition is pending for the initiator.
- The command is issued to an invalid LUN.
- The library has experienced an unrecoverable hardware error.
- The library encounters a problem while scanning the cartridges.
- A reserved bit is set to 1 in the CDB or a parameter in the CDB is invalid (see Table 2-1 for sense data).

Table 2-1: Sense data for invalid parameters in the INITIALIZE ELEMENT STATUS CDB

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.

CHAPTER 3

Initialize Element Status With Range (37h or E7h)

Bit \ Byte	7	6	5	4	3	2	1	0
00	Operation Code (E7h or 37h)							
01	Reserved						Fast [a]	Range [b]
02	(MSB)	Starting Element Address [b]						(LSB)
03								
04	Reserved							
05								
06	(MSB)	Number of Elements [b]						(LSB)
07								
08	Reserved							
09	Control [b]							

a. These bits are ignored.

COMMAND DESCRIPTION

INITIALIZE ELEMENT STATUS WITH RANGE is included in the command set for the tape libraries to support the library's emulation of other libraries.

When the library receives this command, it performs as though it had received the **INITIALIZE ELEMENT STATUS** (07h) command, ignoring any additional parameters supplied with this command. See Chapter 2 – Initialize Element Status (07h), beginning on page 16 for information about the **INITIALIZE ELEMENT STATUS** command.

CHAPTER 4

Inquiry (12h)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (12h)							
01	Obsolete [a]			Reserved			CMDDT [b]	EVPD
02	Page Code							
03	Reserved							
04	Allocation Length							
05	0	0	Reserved				0	0

a. These bits are ignored.

COMMAND DESCRIPTION

The **INQUIRY** command requests that the library send information regarding its parameters to the initiator. The library can return the following categories of data in response to this command:

- The Standard Inquiry Data page, described starting on page 21, contains basic information about the library, including the product identification.

  Note: All of the Spectra Logic tape libraries return SPECTRA PYTHON as the device identifier in response to an **INQUIRY** command.

- The Vital Product Data pages, described starting on page 24, contain additional detailed information about the library. For example, the Unit Serial Number page (Page Code 0x80), described starting on page 25, contains an ASCII representation of the library serial number. Each Vital Product Data page requires a separate **INQUIRY** command from the initiator.

WHAT YOU SEND TO THE LIBRARY

The data returned by the **INQUIRY** command depends on the values of the parameters in the CDB.

Table 4-1: INQUIRY CDB parameter values

Field Name	Values Allowed	Meaning
CMDDT (Command Support Data)	0	The library does not support returning optional command support data.
EVPD (Enable Vital Product Data)	0	Requests the Standard Inquiry Data page (described on page 21). **Note:** If the EVPD bit is set to 0, the Page Code must be 00h.
	1	Request Vital Product Data specific pages (described on page 24), based on the value of the Page Code field (byte 02).
Page Code	00h	Requests the Supported Vital Product Data page (described on page 24)
	80h	Requests the Unit Serial Number page (described on page 25)
	83h	Requests the Device Identification page (described on page 26)
Allocation Length	00–FFh	Specifies the number of bytes that are allocated by the initiator for returned inquiry data. A value of 0 indicates that no inquiry data is to be transferred. This condition is not an error. The library terminates the Data In phase when it transfers either the number of bytes specified by the Allocation Length field or all of the available inquiry data, whichever is less. The lengths for inquiry data pages returned by the library are: **Standard Inquiry Data**: 26h (36 bytes) if the library is exported by a QIP or RIM –OR– 3Ah (58 bytes) if the library is exported by a tape drive **Supported Vital Product Data Pages**: 08h (8 bytes) **Unit Serial Number**: 0Eh (14 bytes) **Device Identification**: 36h (54 bytes)

COMMAND RESPONSE

The data returned in response to the **INQUIRY** command depends on the values for the EVPD, Page Code, and Allocation Length fields in the CDB, as described in the following sections.

Standard Inquiry Data Page

When the EVPD bit (byte 01, bit 0) is 0, the library returns either 36 bytes or 58 bytes of Standard Inquiry Data.

Bit / Byte	7	6	5	4	3	2	1	0
00	Peripheral Qualifier				Peripheral Device Type			
01	RMB	Reserved						
02	Version (03h)							
03	AERC	RSVD	Norm ACA	HiSup	Response Data Format			
04	Additional Length							
05	SCCS	ACC	ALUA		3PC	Reserved		
06	BQue	EncServ	RSV	MultiP	MChngr	Obsolete		Addr16
07	RelAdr	Obsolete	Wbus16	Sync	Linked	Obsolete	Cmd Que	VS
08 ... 15	(MSB) Vendor Identification (LSB)							
16 ... 31	(MSB) Product Identification (LSB)							
32 ... 35	(MSB) Firmware Revision Level (LSB)							
36 ... 55	(MSB) Vendor Specific [a] (LSB)							
56	Reserved [a]				Clocking [a]		QAS [a]	IUS [a]
57	Reserved [a]							

a. Only returned when the library is exported by a direct-attached SCSI tape drive.

Table 4-2: Data returned on the Standard Inquiry Data page

Field Name	Value Returned	Meaning
Peripheral Qualifier	000b	The library is a single LUN device. The value of the Logical Unit Number (LUN) field in the CDB must be set to 0h.
Peripheral Device Type	08h	Identifies the library as a media changer device.
RMB	1	Indicates media is removable from the library.
Version	03h	The library supports the current ANSI version of SPC-3 (SCSI Primary Commands – 3) standard.
NormACA	0	The library does not support setting the Normal ACA Supported bit to 1.
HiSup	0	The library does not use the hierarchical addressing model to assign LUNs to logical units.
Response Data Format	2h	**INQUIRY** data returned by the library conforms to the format defined in the SPC-3 Standard.
Additional Length	31 or 53	Indicates the number of bytes of data following this byte. ▪ **Libraries exported through QIPs or RIMs** return 31 bytes of additional data (Bytes 5 through 35). ▪ **Libraries exported through a direct-attached SCSI drive** return 53 bytes of additional data (Bytes 5 through 57) which include information from the exporting tape drive (Bytes 36 through 57). ▪ **Libraries exported through a direct-attached Fibre Channel drive** return 31 bytes of additional data (Bytes 5 through 35). **Notes:** ▪ Not all tape libraries support direct-attached SCSI drives. ▪ Refer to the tape drive manufacturer's SCSI specification for a definition of the vendor specific bytes (Bytes 36 through 55) and the bits for clocking, QAS, and IUS in Byte 56.
SCCS	0	The library does not contain an embedded storage array controller component.
ACC	0	No access controls coordinator may be addressed through this logical unit.
ALUA	0	The SCSI target device does not support asymmetric logical unit access or vendor-specific asymmetric access. Neither the **REPORT TARGET GROUPS** command nor the **SET TARGET GROUPS** command is supported.
3PC	0	The library does not support third-party copy or **EXTENDED COPY** commands. A 3PC bit of zero indicates that device support for such commands is disabled.
BQue	0	The library does not support tagged tasks (command queuing).

Table 4-2: Data returned on the Standard Inquiry Data page

Field Name	Value Returned	Meaning
EncServ	0	The library does not contain an embedded enclosure services component.
VS (Vendor Specific)	0	The library does not support vendor-specific data.
MultiP	0	The library's port addressing is split.
MChngr	0	The library is not embedded within or attached to a medium transport element.
Addr16	0	When the library is exported through a QIP, RIM, or direct-attached Fibre Channel tape drive, wide SCSI addressing is not supported.
	1	When the library is exported through a direct-attached SCSI drive, wide SCSI addressing is supported.
RelAdr	0	The library does not support relative addressing.
WBus16	0	When the library is exported through a QIP, RIM, or direct-attached Fibre Channel tape drive, 16-bit wide transfers are not supported.
	1	When the library is exported through a direct-attached SCSI drive, 16-bit wide transfers are supported.
Sync	0	When the library is exported through a QIP, RIM, or direct-attached Fibre Channel tape drive, synchronous data transfers are not supported.
	1	When the library is exported through a direct-attached SCSI drive, synchronous data transfers are supported.
Linked	0	The library does not support command linking.
CmdQue	0	The library does not support tagged command queuing.
Vendor Identification	SPECTRA	The left-justified ASCII representation of SPECTRA (uppercase) followed by an ASCII space character. [a]
Product Identification	PYTHON	The left-justified ASCII representation of PYTHON (uppercase) followed by two ASCII space characters. This product identification is returned by all tape libraries. [a]

Table 4-2: Data returned on the Standard Inquiry Data page

Field Name	Value Returned	Meaning
Firmware Revision Level	Varies	The left-justified ASCII representation of the product firmware revision level followed by sufficient ASCII space characters (20h) to fill four bytes.
		For example, a firmware version of ASCII 106 requires one space character to fill the four-byte field; ASCII 2000 fills all four bytes and does not require space characters.
		Note: Currently, this field is fixed to 2000 to prevent operating system drivers from reloading when the firmware version changes.
Clocking	0	The device server only supports single timing.
	00b [b]	Set if the host interface speed has been set to limit transfers to 80 MB/s.
	11b [b]	Set if the host interface speed has not been set to limit transfers to 80 MB/s.
QAS	0	The device server does not support quick arbitration and selection.
IUS	0	The device server does not support information unit transfers.

a. The Vendor Identification and Product Identification data fields change when the library is configured to emulate another vendor's library.

b. Only supported in libraries exported by a direct-attached Ultra160 SCSI drive.

Supported Vital Product Data Page (Page Code 00h)

When the EVPD bit is 1 and the Page Code is 00h, the library returns the Supported Vital Product Data page. The Supported Vital Product Data page lists page codes supported by this device that supply additional Inquiry type data, as described below.

Bit Byte	7	6	5	4	3	2	1	0
00	Peripheral Qualifier			Peripheral Device Type				
01	Page Code (00h)							
02	Reserved							
03	Page Length (03h)							
04	First Page Code Supported (00h – Supported Vital Product Data page)							
05	Second Page Code Supported (80h – Unit Serial Number Data page (see page 25)							
06	Third Page Code Supported (83h – Device Identification page (see page 26)							
07	Reserved							

Unit Serial Number Data Page (Page Code 80h)

When the EVPD bit is 1 and the Page Code is 80h, the library returns the Unit Serial Number page as described below.

Bit Byte	7	6	5	4	3	2	1	0
00	Peripheral Qualifier			Peripheral Device Type				
01	Page Code (80h)							
02	Reserved							
03	Page Length							
04	(MSB)							
...				Unit Serial Number (ASCII)				
13								(LSB)

Table 4-3: Data returned on the Unit Serial Number Data page

Field Name	Value Returned	Meaning
Peripheral Qualifier	000b	The library is a single LUN device. The value of the Logical Unit Number (LUN) field in the CDB must be set to 0h.
Peripheral Device Type	08h	Identifies the library as a media changer device.
Page Code	80h	The current page is the Unit Serial Number Data page.
Page Length	0Ah	The length of the serial number.
Serial Number	Varies	The 10 byte null terminated ASCII representation of the library serial number.

Device Identification Page (Page Code 83h)

The Device Identification page allows the library to report its device identifiers, including its product identifier and serial number. The library returns the Device Identification page when the EVPD bit in the CDB is 1 and the Page Code is 83h

Bit / Byte	7	6	5	4	3	2	1	0
00	Peripheral Qualifier				Peripheral Device Type			
01	Page Code (83h)							
02	Reserved							
03	Page Length							
04	Reserved				Code Set			
05	Reserved				Identifier Type			
06	Reserved							
07	Identifier Length							
08	(MSB)							
...	Vendor Identification							
15								(LSB)
16	(MSB)							
...	Product Identification							
31								(LSB)
32	(MSB)							
...	Unit Serial Number							
41								(LSB)
42	Reserved				Code Set – Node [a]			
43	Reserved		Association – Node [a]		Identifier Type – Node [a]			
44	Reserved							
45	Identifier Length – Node (8h) [a]							
46	(MSB)							
...	Node Identifier [a]							
53								(LSB)

a. Applicable only to Fibre Channel and Gigabit Ethernet (iSCSI) libraries. These fields are not returned on SCSI interface systems.

Table 4-4: Data returned on the Device Identification page

Field Name	Value Returned	Meaning
Peripheral Qualifier	000b	The library is a single LUN device. The value of the Logical Unit Number (LUN) field in the CDB must be set to 0h.
Peripheral Device Type	08h	Identifies the library as a media changer device.
Page Code	83h	The current page is the Device Identification page.
Page Length	26h	A library (partition) exported through a direct-attached SCSI drive returns 38 (26h) bytes following the Page Length byte. **Note:** Not all tape libraries support direct-attached SCSI drives.
	32h	A library (partition) exported through a QIP or RIM returns 50 (32h) bytes following the Page Length byte.
Code Set	02h	The Identifier field (bytes 08 through 43) contains ASCII data.
Identifier Type	01h	The T10 vendor ID (ASCII) Name_Identifier.
Identifier Length	22h	The identifier returned by the library is 34 (22h) bytes in length.
Vendor Identification	SPECTRA [a]	The left-justified ASCII representation of SPECTRA (uppercase) followed by an ASCII space character.
Product Identification	PYTHON [a]	The left-justified ASCII representation of PYTHON (uppercase) followed by two ASCII space characters. This product identification is returned by all tape libraries unless emulation is configured.
Unit Serial Number	Variable [b]	The 10 byte null terminated ASCII representation of the library serial number.
Code Set—Node	01h	The Node Identifier field (bytes 48 through 55) contains binary data.
Identifier Type—Node	03h	The Node Identifier contains an FC_PH Name_Identifier (WWN) associated with the port that received the request (the node).
Identifier Length—Node	08h	The identifier returned by the library is 8 bytes in length.
Node Identifier [c]	Variable	The 64-bit WWN of the exporting QIP, RIM, or direct-attached Fibre Channel tape drive port that received the request.

a. The data returned in the Vendor Identification and Product Identification data fields changes when the library is configured to emulate another vendor's library.
b. The serial number can be up to 10 characters in length.
c. This field is valid only for libraries exported by a Fibre Channel QIP (F-QIP) or RIM and for Fibre Channel drives.

COMMAND STATUS

The library returns a status byte after processing the **INQUIRY** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

The library never returns Busy status for the **INQUIRY** command.

Reservation Conflict

The library never returns Reservation Conflict status for the **INQUIRY** command.

Check Condition

The library returns Check Condition status for the following reasons:

- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 4-5 for sense data).

Table 4-5: Invalid parameters in the INQUIRY CDB

Sense Key	ASC	ASC Q	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.
5h	24h	00h	1	1	0	0	00 02h	Invalid Page Code.
5h	24h	00h	1	1	1	7	00 02h	Page value set but EVPD is 0.

CHAPTER 5

Mode Select (15h)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (15h)							
01	Obsolete [a]			PF	Obsolete			SP
02	Reserved							
03								
04	Parameter List Length							
05	0	0	Reserved				0	0

a. These bits are ignored.

COMMAND DESCRIPTION

The **MODE SELECT** command enables you to specify operating parameters for the library. These parameters configure the library when it is powered on or receives a Bus Device Reset message. The library supports the following **MODE SELECT** parameter list pages:

- The Element Address Assignments Page (1Dh) has the following changeable parameters:

    - Medium Transport Element Address (transporter), bytes 2–3
    - First Storage Element Address (magazine slots), bytes 6–7
    - First Import/Export Element Address (TAP), bytes 10–11
    - First Data Transfer Element Address (drives), bytes 14–15

- The Transport Geometry Page (1Eh) has no changeable parameters
- The Device Capabilities Page (1Fh) has no changeable parameters

Any changed parameters apply to all initiators in a multi-initiator environment. If mode parameters are changed, the library generates a Unit Attention message to all initiators, except the one that issued the **MODE SELECT** command, with sense information to indicate that mode parameters have changed.

Notes: ▪ Before issuing any **MODE SELECT** command, issue a **MODE SENSE** command (see Mode Sense (1Ah) on page 36) with the following values in the CDB:

- ▪ **Page Code = 3Fh**—Causes the library to return all mode pages.
- ▪ **Page Control = 01**—Causes the library to indicate which fields are changeable.

▪ The recommended timeout for this command is 20 minutes or 1200 seconds.

WHAT YOU SEND TO THE LIBRARY

To change parameter values, send a **MODE SELECT** command with the following parameters, followed by a parameter list in the Data Out phase.

Table 5-1: MODE SELECT CDB parameter values

Field Name	Values Allowed	Meaning
PF	1	The library supports the page format defined by the SPC-3 standard.
SP (Save Pages)	0	Current configuration values are changed to the values sent to the library. Saved values stored in nonvolatile memory are not affected. The default values are restored when the device is reset or power cycled.
	1 [a]	Current configuration values are changed to the values sent to the library and saved in nonvolatile memory.
Parameter List Length	00–FFh	This field indicates the length of the entire parameter list. The parameter list length is equal to the length of one Parameter List Header (4 bytes) plus the lengths of all pages to be transferred. When the value of the parameter list length is 00h, no parameter list is transferred from the initiator. This is not considered an error. The data length for all mode parameter pages returned by the library is 48 bytes (30h). **Notes:** ▪ A parameter list length of 4 is not valid. When you send the Parameter List Header, you must send at least one page with it. ▪ Before issuing a **MODE SELECT** command, issue a **MODE SENSE** command (see Mode Sense (1Ah) on page 36) with the Page Control field set to 1 and the Page Code field set to 3Fh. This allows you to determine the supported pages, the changeable parameters within the pages, and the supported length of each page.

a. This is only allowed for page 1Dh.

Mode Parameter Lists

During the Data Out phase following the command block the initiator sends the Parameter List Header, followed by one or more parameter list pages containing the new parameter values of the library.

Parameter List Header

If you send one or more parameter pages with the **MODE SELECT** command, you must send a Parameter List Header. Do not send the Parameter List Header if you are not sending any parameter pages.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved							
01								
02								
03								

All fields of the Parameter List Header are reserved and must be set to zero.

Element Address Assignment Page (Page Code 1Dh)

The library only supports changing the element addresses.

⚠️ **Important** The element addresses for the elements in an element group must not overlap the addresses for other element groups.

⚠️ **Important** The elements in an element group (that is, cartridge slots, robotics, and drives) must be assigned contiguous addresses.

⚠️ **Important** Element addresses must be between 0 and 65,535 (FFFFh).

Bit Byte	7	6	5	4	3	2	1	0
00	PS	Reserved	Page Code (1Dh)					
01	Parameter Length (12h)							
02	(MSB)	Medium Transport Element Address (default=00 01h)						
03								(LSB)
04	(MSB)	Number of Medium Transport Elements [a] (fixed at 01h for all tape libraries)						
05								(LSB)
06	(MSB)	First Storage Element Address (default=10 00h)						
07								(LSB)
08	(MSB)	Number of Storage Elements [a] (depends on partition size)						
09								(LSB)
10	(MSB)	First Import/Export Element Address (default=0010h)						
11								(LSB)
12	(MSB)	Number of Import/Export Elements [a] (depends on partition configuration)						
13								(LSB)
14	(MSB)	First Data Transfer Element Address (default=0100h)						
15								(LSB)
16	(MSB)	Number of Data Transfer Elements [a] (depends on partition size)						
17								(LSB)
18	Reserved							
19								

a. The data MUST match the response from **MODE SENSE** page 1Dh. It cannot be set to zero.

Table 5-2: Data sent on the Element Address Assignment page

Field Name	Value	Meaning
PS (Pages Saveable)	0	The Element Address Parameter page can be saved to nonvolatile memory by setting the SP field in the **MODE SELECT** command.
Page Code	1Dh	Identifies the Element Address Assignment page.
Parameter List Length	12h (18)	Indicates that there are an additional 18 bytes of element address data that follow this byte.
Medium Transport Element Address	Varies	Indicates the element address for the medium transport element (the transporter). The default value is 00 01h.
Number of Medium Transport Elements	01h [a]	The library has only one medium transport element (the transporter). This is also true for libraries that may have more than one physical robot like the TFinity.
First Storage Element Address	Varies	Indicates the element address for the first storage element (magazine slot) in the logical library (partition). The default is 10 00h (4096).
Number of Storage Elements	Varies [a]	Indicates the configured number of storage locations (magazine slots) within the logical library (partition). **Note:** This parameter depends on partition size and cannot be changed.
First Import/Export Element Address	Varies	Indicates the element address of the first import/export element. The default is 00 10h (16).
Number of Import/ Export Elements	Varies [a]	Indicates the total number of locations (slots) used for importing and exporting cartridges into and out of the logical library (partition). **Notes:** ▪ This parameter depends on partition configuration and cannot be changed. ▪ For all tape libraries except the T120 and the T50e, the import/ export elements are the slots assigned to the entry/exit pool for the partition. ▪ For the T120 and the T50e libraries, the import/export elements are the slots in the entry/exit port.
First Data Transfer Element Address	Varies	Indicates the element address of the first data transfer element (a drive). The default is 01 00h (256).
Number of Data Transfer Elements	Varies [a]	Indicates the total number of data transfer elements. **Note:** This parameter depends on partition size and cannot be changed.

a. The data MUST match the response from **MODE SENSE** page 1Dh. It cannot be set to zero.

COMMAND STATUS

The library returns a status byte after processing the **MODE SELECT** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors (that is, when the requested **MODE SELECT** parameters have been copied over the current **MODE SELECT** settings).

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 14 – Reserve (16h), beginning on page 88 for more information about the **RESERVE** command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- The library detects an unrecoverable parity error while receiving the **MODE SELECT** data.
- A parameter in the CDB on a **MODE SELECT** page is invalid (see Table 5-3 for sense data).

Table 5-3: Invalid parameters in the MODE SELECT CDB and mode data

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	1Ah	00h	1	1	0	0	00 04h	Invalid Parameter List Length.
5h	21h	01h	1	0	0	0	[a]	Address overlap. The field pointer is set to 00 0Ah, indicating that there is an address overlap for a Storage Element Address in the Element Address Assignment page.
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.
5h	24h	00h	1	1	1	4h	00 01h	Invalid PF (page format). Must be set to 1.
5h	26h	00h	1	0	0	0	[a]	▪ Invalid values in the Parameter List Header. All values must be 0. The value of the field pointer is the value of the first field that contains a non-zero value (00, 01, 02, or 03). ▪ Invalid Parameter Length. ▪ Reserved bits set in the reserved fields 22 or 23 (bytes 18 or 19 of the Element Address Assignment page). ▪ Storage element addresses are not consecutive. ▪ Address wrap. Number of elements causes the address range to wrap back to 00 00.
5h	26h	00h	1	0	1	5h	[a]	Invalid Page Code.
5h	26h	00h	1	0	1	7h	[a]	Reserved bits set in the first byte of one of the **MODE SELECT** pages.

a. Field pointer depends on the order in which the pages are sent.

Mode Sense (1Ah)

The SPC-3 Standard provides both a 6-byte and a 10-byte **MODE SENSE** command. Spectra tape libraries only support both the 6 byte **MODE SENSE** command.

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (1Ah)							
01	Obsolete [a]			Reserved	DBD	Reserved		
02	PC		Page Code					
03	Reserved							
04	Allocation Length							
05	0	0	Reserved			0	0	0

a. These bits are ignored.

COMMAND DESCRIPTION

The **MODE SENSE** command enables the library to report its operating mode parameters to the initiator. The initiator can request one or all of the supported mode pages. Each response includes four bytes for the Parameter List Header, followed by the specified number of bytes for each page:

- 20 bytes for the Element Address Assignment page (1Dh)
- 4 bytes for the Transport Geometry Descriptor page (1Eh)
- 20 bytes for the Device Capabilities page (1Fh)

These pages are described in detail under Command Response on page 38.

You can change the element address parameters on the Element Address Assignment page using the **MODE SELECT** (15h) command (see Chapter 5 – Mode Select (15h), beginning on page 29). The Transport Geometry Descriptor page and the Device Capabilities page do not have any changeable parameters.

Note: The recommended timeout for this command is 20 minutes or 1200 seconds.

WHAT YOU SEND TO THE LIBRARY

The data returned by the **MODE SENSE** command depends on the values of the parameters in the CDB.

Table 6-1: MODE SENSE CDB parameter values.

Field Name	Values Allowed	Meaning
DBD (Disable Block Descriptors)	0 or 1	The library does not return block descriptors even if requested to do so. This is not an error condition. The library always returns a block descriptor length of 0.
Page Control	0 (00b)	Requests the current parameter values. The current values returned are: ▪ The parameters set in the last successful **MODE SELECT** command. ▪ The saved values, if a **MODE SELECT** command has not been executed since the last power-on or reset. ▪ The default values, if saved values are not available.
	1 (01b)	Requests the changeable parameters. The pages you request are returned and indicate which parameters you can change. All bits of parameters that you can change are set to 1. All bits of parameters that you cannot change are set to 0. The Page Code and Parameter List Length fields contain actual values. **Note:** Before issuing a **MODE SELECT** command, issue a **MODE SENSE** command with the PC field set to 1 and the Page Code field set to 3Fh. This allows you to determine the supported pages, the changeable parameters within the pages, and the supported length of each page.
	2 (10b)	Requests default values. The pages you request are returned with the default value for each supported parameter. Parameters that are not supported by the library are set to 0.
	3 (11b)	Requests saved values. The pages you request are returned with the saved setting for each supported parameter. Parameters that are not supported by the library are set to 0. **Note:** If changes to the page have not been saved, the library returns the current values.
Page Code	3Fh	Requests that the library return all available mode pages.
	1Dh	Requests Element Address Assignment page only.
	1Eh	Requests Transport Geometry Parameters page only.
	1Fh	Requests Device Capabilities page only.
	00h	Not used.

Table 6-1: MODE SENSE CDB parameter values.

Field Name	Values Allowed	Meaning
Allocation Length	00–FFh	Specifies the length of the parameter list the library will return. The maximum length required to receive all pages is 48 bytes (30h). No mode data is transferred if you specify zero. This condition is not considered an error. The library terminates the Data In phase when it transfers either the number of bytes specified by the Allocation Length or when all available **MODE SENSE** data have been transferred, whichever is less.

COMMAND RESPONSE

This section describes the page structure for mode data and the pages that the library supports. The **MODE SENSE** command returns a single mode data page or all mode data pages as specified in the Page Code field of the CDB. Each mode data page begins with a four-byte Parameter List Header, followed by zero or more variable-length mode data parameters defined for the specified page.

If all mode pages are requested, the library returns 48 bytes of mode sense data to the initiator, structured as follows:

- 4 bytes of Parameter List Header data
- 20 bytes of Element Address Assignments data
- 4 bytes of Transport Geometry Descriptors data
- 20 bytes of Device Capabilities Parameters data

   Note: When a specific page is requested, the library returns only the Parameter List Header data and the specified page.

Parameter List Header

6-Byte

Bit Byte	7	6	5	4	3	2	1	0
00	Mode Data Length							
01	Reserved							
02								
03								

Mode Data Length indicates the number of bytes of parameter information following the Mode Data Length byte. For the 6-Byte SCSI command, if all mode pages are requested, this value is 44 (2Ch).

Element Address Assignment Page (Page Code 1Dh)

The library returns the following data for the Element Address Assignment page. See Elements and Element Addresses on page 13 for additional information.

Note: If the library (or partition) is configure to emulate another vendor's library, the format of the element address data returned by this page may change.

Bit Byte	7	6	5	4	3	2	1	0
00	PS	Reserved	Page Code (1Dh)					
01	Parameter Length (12h)							
02	(MSB)	Medium Transport Element Address (default=00 01h)						
03								(LSB)
04	(MSB)	Number of Medium Transport Elements (fixed at 01h for all tape libraries)						
05								(LSB)
06	(MSB)	First Storage Element Address (default=10 00h)						
07								(LSB)
08	(MSB)	Number of Storage Elements (depends on partition size)						
09								(LSB)
10	(MSB)	First Import/Export Element Address (default=0010h)						
11								(LSB)
12	(MSB)	Number of Import/Export Elements (depends on configuration)						
13								(LSB)
14	(MSB)	First Data Transfer Element Address (default=0100h)						
15								(LSB)
16	(MSB)	Number of Data Transfer Elements (depends on partition size)						
17								(LSB)
18	Reserved							
19								

Table 6-2: Data returned on the Element Address Assignment page

Field Name	Value Returned	Meaning
PS (Pages Saveable)	1	The Element Address Assignment page can be saved to nonvolatile memory by setting the SP field in the **MODE SELECT** command. See Chapter 5 – Mode Select (15h), beginning on page 29 for details.
Page Code	1Dh	Identifies the Element Address Assignment page.
Parameter List Length	12h (18)	Indicates that there are an additional 18 bytes of element address data that follow this byte.
Medium Transport Element Address	Varies	Indicates the element address for the medium transport element (the transporter). The default value is 00 01h.
Number of Medium Transport Elements	01h	The library has only one medium transport element (the transporter). This is also true for libraries that may have more than one physical robot like the TFinity.
First Storage Element Address	Varies	Indicates the starting address for the storage elements (magazine slots) in the logical library (partition). The default starting address is 10 00h (4096). You can change this address with the **MODE SELECT** (15h) command.
Number of Storage Elements	Varies [a]	Indicates the configured number of storage locations (magazine slots) within the logical library (partition).
First Import/Export Element Address	Varies	Indicates the element address of the first import/export element. The default is 00 10h (16).
Number of Import/Export Elements	Varies [b]	Indicates the total number of locations (slots) used for importing and exporting cartridges into and out of the logical library (partition). **Notes:** ▪ For all tape libraries except the T120 and the T50e, the import/export elements are the slots assigned to the entry/exit pool for the partition. ▪ For the T120 and the T50e libraries, the import/export elements are the slots in the entry/exit port.
First Data Transfer Element Address	Varies	Indicates the element address of the first data transfer element (a drive). The default is 01 00h (256).
Number of Data Transfer Elements	Varies [b]	Indicates the total number of data transfer elements.

a. Depends on the partition size.
b. Depends on the partition configuration.

Transport Geometry Parameters (Page Code 1Eh)

The library returns the following data for the Transport Geometry Parameter page.

Note: The parameters on the Transport Geometry Parameter page cannot be changed using a **MODE SELECT** command.

Bit Byte	7	6	5	4	3	2	1	0
00	PS	Reserved	Page Code (1Eh)					
01	Parameter Length							
02	Reserved							Rotate
03	Member Number in Transport Element Set							

Table 6-3: Data returned on the Transport Geometry Parameter page

Field Name	Value Returned	Meaning
PS (Pages Saveable)	0	The Transport Geometry Parameter page cannot be saved to nonvolatile memory.
Page Code	1Eh	Identifies the Transport Geometry Parameter page.
Parameter List Length	02h	Indicates the number of additional bytes of transport geometry descriptor data that follow the header. Each descriptor consists of two bytes of information. The library has only one transport mechanism (transporter), so the value returned for this field is always 02h even for libraries that have more than one physical robot like the TFinity.
Rotate	0b	Indicates the ability of the transport mechanism to handle two-sided media. The library only uses one-sided media, so the value returned for this field is always 0.
Member Number in Transport Element Set	00h	Indicates the specific transport element in the system to which this descriptor is applied. The library has only one medium transport element, so the value returned for this field is always 0. This is true even for libraries that may have more than one physical robot like the TFinity.

Device Capabilities Page (Page Code 1Fh)

The library returns the following data for the Device Capabilities page.

Note: The parameters on the Device Capabilities page cannot be changed using a **MODE SELECT** command.

Bit Byte	7	6	5	4	3	2	1	0
00	PS	RSVD	Page Code (1Fh)					
01	Parameter Length (12h)							
02	Reserved				DT 1	I/E 1	ST 1	MT 0
03	Reserved							
04	Reserved				MT→DT 1	MT→I/E 1	MT→ST 1	MT→MT 0
05	Reserved				ST→DT 1	ST→I/E 1	ST→ST 1	ST→MT 0
06	Reserved				I/E→DT 1	I/E→I/E 1	I/E→ST 1	I/E→MT 0
07	Reserved				DT→DT 1	DT→I/E 1	DT→ST 1	DT→MT 0
08 … 11	Reserved							
12	Reserved (0)				MT↔DT 0	MT↔IE 0	MT↔ST 0	MT↔MT 0
13					ST↔DT 0	ST↔IE 0	ST↔ST 0	ST↔MT 0
14					IE↔DT 0	IE↔IE 0	IE↔MT 0	IE↔MT 0
15					DT↔DT 0	DT↔IE 0	DT↔ST 0	DT↔MT 0
16 … 19	Reserved							

Table 6-4: Data returned on the Device Capabilities page

Field Name	Value Returned	Meaning
PS (Pages Saveable)	0	The Device Capabilities page cannot be saved to nonvolatile memory.
Page Code	1Fh	Identifies the Device Capabilities page.
Parameter List Length	12h	Indicates the number of additional bytes of Device Capabilities data that follow the header. See Table 6-5 for the definition of abbreviations used.

The following abbreviations and definitions apply to the fields in the Device Capabilities page:

Table 6-5: Field definitions for the Device Capabilities page

Abbreviation or Symbol	Definition
DT	Data transfer element (tape drive)
IE	Import/export element (TAP)
ST	Storage element (magazine slot)
MT	Medium transport element (transporter)
Stor	A value of 1 in a **StorXX** bit indicates media can be stored at elements of type **XX**. A value of 0 indicates that they cannot. For example, the 1 in the StorDT bit indicates that media can be stored at data transfer element addresses (tape drives).
→	A value of 1 in a XX → YY bit indicates that media can be moved from elements of type XX to elements of type YY. A value of 0 indicates that media cannot be moved from elements of type XX to elements of type YY. For example, the 0 in the MT→MT bit indicates that media cannot be moved from one medium transport element to another medium transport element. This is because there is only one medium transport element.
↔	A 1 in a XX↔YY bit indicates that media can be exchanged between elements of types XX and YY. All of these values are 0 because the library does not support media exchanges.

COMMAND STATUS

The library returns a status byte after processing the **MODE SENSE** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when the library is reserved by a different initiator. See Chapter 14 – Reserve (16h), beginning on page 88 for more information about the **RESERVE** command.

Check Condition

The library returns Check Condition status for the following reasons:

▪ The command is issued to an invalid LUN.
▪ A Unit Attention condition is pending for the initiator.
▪ A reserved bit is set to 1 in the CDB.
▪ A parameter in the CDB is invalid (see Table 6-6 for sense data).

Table 6-6: Invalid parameters in the MODE SENSE CDB

Sense Key	ASC	ASC Q	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.
5h	24h	00	1	1	1	3h	00 01h	Invalid value in DBD field. Must be 1.
5h	24h	00	1	1	1	5h	00 02h	Invalid Page Code.

CHAPTER 7

Move Medium (A5h)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (A5h)							
01	Obsolete ª			Reserved				
02	(MSB)			Transport Element Address				
03								(LSB)
04	(MSB)			Source Address				
05								(LSB)
06	(MSB)			Destination Address				
07								(LSB)
08	Reserved							
09								
10	Reserved							Invert
11	0	0	Reserved			0	0	0

a. These bits are ignored.

COMMAND DESCRIPTION

The **MOVE MEDIUM** command requests that the library move media from one element location to another. The locations are identified by their element addresses. For the valid source element and destination element combinations for the **MOVE MEDIUM** command, see Device Capabilities Page (Page Code 1Fh) on page 42.

Send a **READ ELEMENT STATUS** command to the library to determine the current element addresses and which elements contain media (see Chapter 10 – Read Element Status (B8h), beginning on page 53).

Note: The recommended timeout for this command is 20 minutes or 1200 seconds per library partition.

WHAT YOU SEND TO THE LIBRARY

The behavior of the library in response to the **MOVE MEDIUM** command depends on the values of the parameters in the CDB.

Table 7-1: MOVE MEDIUM CDB field values

Field Name	Values Allowed	Meaning
Transport Element Address	Varies [a]	The element address of the picker (the default is 00 01h). This value should match the value from **MODE SENSE** or be 00 00h.
Source Address	Varies [a]	The current element address of the slot or drive where the cartridge is located.
Destination Address [b]	Varies [a]	The element address of the slot or drive where the cartridge will be moved.
Invert	0	tape libraries use single-sided media and do not support the invert function.

a. Permitted values for the Transport Element Address, Source Address, and Destination Address can be changed with the MODE SELECT command (see Chapter 5 – Mode Select (15h), beginning on page 29). Use the MODE SENSE command to determine the current element address settings, including the default element addresses (see Chapter 6 – Mode Sense (1Ah), beginning on page 36).

b. Moves to or from the medium transport element (transporter) are not allowed.

COMMAND STATUS

The library returns a status byte after processing the **MOVE MEDIUM** command.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 14 – Reserve (16h), beginning on page 88 for more information about the **RESERVE** command.

Check Condition

The library returns Check Condition status for the following reasons:

- A Unit Attention condition is pending for the initiator.
- The library has experienced an unrecoverable hardware error.
- A reserved bit is set to 1 in the CDB.
- The information in the cartridge inventory indicates that the requested cartridge move operation cannot be performed.
- After the library attempts to move a cartridge, it finds that the source is empty or the destination is occupied.
- The library encounters a problem while trying to move a cartridge. For example, it encounters a place or put error while moving a cartridge.
- A parameter in the CDB is invalid (see Table 7-2 for sense data).

Table 7-2: Invalid parameters in the MOVE MEDIUM CDB and move errors

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
3h	53h	00h	0	0	0	0	0	Media load or eject failed
4h	85h	01h						Move failed; tape left in picker.
4h	85h	02h						Move failed; tape left in source.
5h	21h	01h	1	1	0	0	00 02h	Invalid transport element address.
5h	21h	01h	1	1	0	0	00 04h	Invalid source element address.
5h	21h	01h	1	1	0	0	00 06h	Invalid destination element address.
5h	24h	00	1	1	1	0	00 0Ah	Invalid Invert field.
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.
5h	3Bh	0Dh	0	0	0	0	0	Destination element is occupied.
5h	3Bh	0Eh	0	0	0	0	0	Source element is empty.
5h	3Bh	11h						Media magazine not accessible. This will only occur in libraries with TeraPack magazines.
5h	80h	05h	0	0	0	0	0	Source drive not installed.
5h	80h	06h	0	0	0	0	0	Destination drive not installed.
5h	80h	18h						Reservation conflict. Element is reserved. This occurs when the slot is reserved by the front panel for queued ejects. See Overview of T120 and T50e Entry/Exit Modes on page 73.

CHAPTER 8

Prevent/Allow Medium Removal (1Eh)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (1Eh)							
01	Obsolete [a]			Reserved				
02	Reserved							
03								
04	Reserved						Prevent	
05	0	0	Reserved			0	0	0

a. These bits are ignored.

COMMAND DESCRIPTION

The **PREVENT/ALLOW MEDIUM REMOVAL** command requests that the library enable or disable removal of media through the import/export elements.

WHAT YOU SEND TO THE LIBRARY

The library behavior as a result of the **PREVENT/ALLOW MEDIUM REMOVAL** command depends on the value of the Prevent bit in the CDB.

Table 8-1: PREVENT/ALLOW MEDIUM REMOVAL CDB parameter values

Field Name	Values Allowed	Meaning
Prevent	0 (00b)	Media removal is allowed.
	1 (01b)	Media removal is prevented.

Note: When the Prevent bit is set to 01b, media cannot be accessed in the import/export elements until one of the following occurs:

- All initiators that have issued **PREVENT MEDIUM REMOVAL** commands issue **ALLOW MEDIUM REMOVAL** commands with the Prevent bit set to 0.
- The library is reset.

COMMAND STATUS

The library returns a status byte after processing the **PREVENT/ALLOW MEDIUM REMOVAL** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator and a request is made to prevent medium removal. See Chapter 14 – Reserve (16h), beginning on page 88 for more information about the **RESERVE** command.

Check Condition

The library returns Check Condition status when:

▪ A Unit Attention condition is pending for the initiator.
▪ A reserved bit is set to 1 in the CDB

Table 8-2: Invalid parameters in the PREVENT/ALLOW MEDIUM REMOVAL CDB

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers show the bit in error.

CHAPTER 9

Read Buffer (3Ch)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (3Ch)							
01	Reserved			Mode				
02	Buffer ID (00h)							
03 ... 05	Buffer Offset (00h, 00h, 00h)							
06 ... 08	Allocation Length (00h, 00h, 01h)							
09	0	0	Reserved			0	0	0

COMMAND DESCRIPTION

The **READ BUFFER** command is only provided to retrieve the library's serial number, IP address, library name, and partition name.

This library serial number is the same as the BlueScale license serial number used to issue license keys for BlueScale features. This serial number is different than the one reported from the **INQUIRY** command. This value is not changeable.

What You Send to the Library

The following parameters set the **READ BUFFER** command to retrieve the library's serial number.

Table 9-1: READBUFFER CDB field values

Field Name	Values Allowed	Meaning
Mode	02h	Set mode to data only. This is the preferred method.
	03h	Set mode to descriptor only.
Buffer ID	00h	Specifies the buffer ID for the library serial number.
Buffer Offset	00 00 00 h	Specifies the buffer offset for the library serial number. The library does not support buffer offsets. This value must be set to 0.
Allocation Length	00 00 10 h	Specifies the length of the data returned. For the library serial number, the recommended value is 00 00 10h.

The following parameters set the **READ BUFFER** command to retrieve the library's IP address, library name, and partition name.

Table 9-2: READBUFFER CDB field values

Field Name	Values Allowed	Meaning
Mode	02h	Set mode to data only. This is the preferred method.
	03h	Set mode to descriptor only.
Buffer ID	01h	Specifies the buffer ID for the library IP address, library name, and partition name.
Buffer Offset	00 00 00 h	Specifies the buffer offset for the data returned. The library does not support buffer offsets. This value must be set to 0.
Allocation Length	00 00 66 h	Specifies the length of the data returned. For the library's IP address, library name, and partition name, the value is 00 00 66 h.

COMMAND RESPONSE

For Buffer ID 00h, the 16-byte response returned by the library is the library serial number, left justified with trailing zeros (0).

For Buffer ID 01h, the data returned is:

- Four bytes of IP address
- 65 bytes for the Library Name
- 33 bytes for the Partition Name

COMMAND STATUS

The library returns a status byte after processing the **READ BUFFER** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when the library is reserved by a different initiator. See Chapter 14 – Reserve (16h), beginning on page 88 for more information about the **RESERVE** command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 9-3 for sense data).

Table 9-3: **Invalid parameters in the MODE SENSE CDB**

Sense Key	ASC	ASC Q	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.
5h	24h	00	1	1	1	3h	00 01h	Invalid value in DBD field. Must be 1.
5h	24h	00	1	1	1	5h	00 02h	Invalid Page Code.

Read Element Status (B8h)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (B8h)							
01	Obsolete [a]			VolTag	Element Type Code			
02	(MSB)			Starting Element Address				
03								(LSB)
04	(MSB)			Number of Elements				
05								(LSB)
06	Reserved						CurData	DVCID
07	(MSB)			Allocation Length				
08								
09								(LSB)
10	Reserved							
11	0	0	Reserved			0	0	0

a. These bits are ignored.

COMMAND DESCRIPTION

The **READ ELEMENT STATUS** command requests that the library return the status of the selected elements in the library. An element's status includes its element address, element type, whether it contains media, whether it is accessible, and whether it is in an abnormal state.

> **Note:** The recommended timeout for this command is 20 minutes or 1200 seconds.

- If the VolTag bit is set, media barcode information is also returned.

- If **Include tape generation in Read Element Status** is selected on the BlueScale Advanced Partition Setting screen (see the *User Guide* for your library for information on accessing the screen), Media Domain, Media Type, Drive Domain, and Drive Type are included as shown in the following sections.
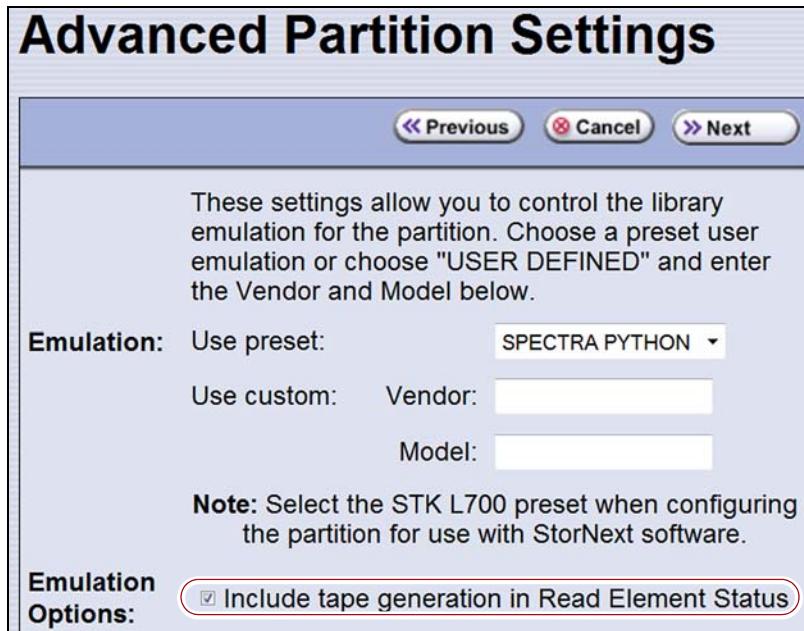
Figure 1 Enable including media and drive generation information in the Read Element Status on the BlueScale Advanced Petition Settings screen.

What You Send to the Library

The data returned by the **READ ELEMENT STATUS** command depends on the values of the parameters in the CDB.

Table 10-1: READ ELEMENT STATUS CDB parameter values

Field Name	Values Allowed	Meaning
VolTag	0	Do not return volume tag (barcode label) information.
	1	Return volume tag (barcode label) information. ⚠ **Important:** VolTag must be set to 1 if you want the library to return the barcode label information for the media at the specified element address.
Element Type Code	0h	Return status for all element types. For an Element Type Code of 0h, the element types are reported in element address order, beginning with the Starting Element Address. [a]
	1h	Return status for the Medium Transport Element (transporter).
	2h	Return status for the Storage Elements (magazine slots).
	3h	Return status for the I/E Port Elements (TAP).
	4h	Return status for the Data Transfer Elements (drives).
Starting Element Address	Varies [a]	Indicates the element address at which to start the transfer of data. Only data for elements of the specified type with addresses greater than or equal to the starting address are reported.
Number of Elements	Varies [b]	Specifies the maximum number of element descriptors to be returned. This is the actual number of element descriptors to be returned, not an element address range. The largest value supported is FFFFh. Specifying FFFFh will return all elements with addresses greater than or equal to the starting element address.
CURDATA	—	The CURDATA (current data) bit determines whether the library allows device motion in order to update element status. This bit is ignored because the library always maintains an updated inventory.
DVCID	0	The library will not return device identifiers.
	1	The library will return device identifiers, if available. Currently, only the Data Transfer Element Descriptor provides the device identifier information.

Table 10-1: READ ELEMENT STATUS CDB parameter values

Field Name	Values Allowed	Meaning
Allocation Length	Any [b]	Specifies the amount of space, in bytes, that you are allocating for the element descriptors returned by the command. Only complete element descriptors are returned. The library returns element descriptors until one of the following conditions is met: ▪ All available element descriptors have been returned. ▪ The number of element descriptors specified in the Number of Elements field has been returned. ▪ The remaining Allocation Length is smaller than the next complete element descriptor or header to be returned.

a. The Starting Element Address can be from zero to the maximum number for the type of element. Permitted values for the Starting Element Address can be changed with the MODE SELECT command (see Chapter 5 – Mode Select (15h), beginning on page 29). Use the MODE SENSE command to determine the current element address settings, including the default element addresses (see Chapter 6 – Mode Sense (1Ah), beginning on page 36).

b. Setting these fields to zero does not constitute an error.

COMMAND RESPONSE

This section describes the Element Status page structure and the element descriptors that the library supports.

The **READ ELEMENT STATUS** command returns an eight-byte header followed by one Element Status Page for each group of element descriptors of the same type.

Each Element Status Page contains a headers and Element Descriptors for each element reported. Each Element Type has a different format, and the data block size varies by element type. The header defines this information for each element type. The following sections illustrate the Element Descriptors for each element type.

Element Status Header

This header is returned once for each **READ ELEMENT STATUS** command received by the library.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)			First Element Address Reported				
01								(LSB)
02	(MSB)			Number of Elements Reported				
03								(LSB)
04	Reserved							
05	(MSB)		Byte Count of Element Status Pages for Elements that Meet CDB Requirements (does not include this header)					
06								
07								(LSB)

Table 10-2: Element Status Header parameter values returned for the **READ ELEMENT STATUS** command

Field Name	Value Returned	Meaning
First Element Address Reported	Varies	Indicates the smallest element address found that meets the CDB requirements.
Number of Elements Reported	Varies	Indicates the total number of elements that meet the CDB requirements. If the Element Type Code parameter is 0, this number will be the total number of elements in the library. If the Element Type Code is 1, 2, 3, or 4, this number will be the number of elements of the specified type (see Element Type Code on page 55). The library returns element descriptors for all of these elements if you specified a sufficient Allocation Length.
Byte Count of Element Status Pages for Elements that Meet CDB Requirements	Varies	Indicates the total number of bytes of element status page data available that meet the CDB requirements. This value is not adjusted to match the value that you specified for the Allocation Length field in the CDB.

Element Status Pages

The Element Status Header is followed immediately by Element Status Pages for each element type reported. Each Element Status Page consists of a header followed by one Element Status Page for each group of element descriptors of the same type (that is, it returns one page for each of the following element groups, regardless of the number of elements in the group: medium transport element, Storage Elements, I/E Port Element, and data transfer elements).

The Element Status Page is returned only if there is at least one Element Descriptor also being returned.

Bit Byte	7	6	5	4	3	2	1	0
00	Element Type Code							
01	PVolTag	AVolTag	Reserved					
02	(MSB)	Element Descriptor Length						
03		(depends on VolTag bit and DVCID bit settings)						(LSB)
04	Reserved							
05	(MSB)	Byte Count of Descriptor Data Available						
06		(For this Element Status Page only, not including this header, n-7)						
07								(LSB)
8	(MSB)							
...		Element Descriptor(s)						
		(Length depends on element type, see descriptions below)						
n								(LSB)

ELEMENT DESCRIPTORS

Following each Element Status Page header are one or more Element Descriptors, one for each element reported of the type identified by the Element Type Code in the header. Each element descriptor includes the element address and element status. An element descriptor can also contain sense code information as well as other information, depending on the element type.

Notes: ▪ The element descriptors for the elements are very similar, with the exception of a few of the fields. Note the differences in bytes 02, 06, and 07 for the element descriptors.

▪ The library does not support alternate volume tags. This information is not included in any of the element descriptors.

The four types of Element Status Pages are:

▪ Medium Transport Element Descriptor on page 59
▪ Storage Element Descriptor on page 62
▪ Data Transfer Element Descriptor on page 65
▪ Import/Export Element Descriptor on page 70

Medium Transport Element Descriptor

The medium transport element is the transporter (robot). The library contains one medium transport element (even if it contains two robots), for which it returns the following medium transport element descriptor.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)			Element Address				
01								(LSB)
02			Reserved			Except	Reserved	Full
03				Reserved				
04				Additional Sense Code				
05				Additional Sense Code Qualifier				
06				Reserved				
07								
08								
09	SValid	Invert			Reserved			
10	(MSB)			Source Storage Element Address				
11								(LSB)
12 ... 47	Primary Volume Tag Information (field omitted if PVolTag = 0)							
48 ... 51	Reserved (field moved up if PVolTag = 0)							
52	Media Domain (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
53	Media Type (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
54 to 55	Reserved (00h, 00h) (field omitted if PVolTag = 0)							

Table 10-3: Parameter values returned in the Medium Transport Element descriptor

Field Name	Value Returned	Meaning
Element Address	Varies	Shows the current element address of the medium transport element (the transporter). The default element address is 00 01h.
Except	0	Indicates that the medium transport element is in some sort of abnormal state. More information on the nature of the exception is available in the ASC and ASCQ fields.
	1	Indicates that the medium transport element is in a normal state.
Full	0	Indicates that the medium transport element does not contain media.
	1	Indicates that the medium transport element contains media.
Additional Sense Code (ASC)	Varies	The ASC and ASCQ together may provide more information about the condition that caused the Except bit to be set to 1.
Additional Sense Code Qualifier (ASCQ)	Varies	Their meaning here is the same as the ASC and ASCQ returned to the **REQUEST SENSE** command. See Appendix A – Error Reporting, beginning on page 96 for information about the meanings of all ASC/ASCQ combinations.
SValid (Source Valid)	0	Indicates that the value in the Source Storage Element Address field is not valid.
	1	Indicates that the value in the Source Storage Element Address field is valid.
Invert	0	The Spectra Tape Libraries do not support two-sided media and do not invert the media. This bit is always 0.
Source Storage Element Address	Varies	Shows the address of the last element from which the media was moved.
Primary Volume Tag Information	Varies [a]	▪ If the PVolTag bit in the data header is 1, this field contains the ASCII representation of the barcode label (volume tag) information for the media occupying this element. ▪ If the PVolTag bit is 0, this field is omitted entirely. **Note:** There is rarely a barcode associated with the medium transport element.
Media Domain [b] **Note:** This field is not valid if the Full bit is not set.	43h	Indicates that the element contains a cleaning cartridge.
	4Ch	Indicates that the element contains an LTO cartridge.
	4Ah	Indicates that the element contains a TS11x0 technology cartridge.

Table 10-3: Parameter values returned in the Medium Transport Element descriptor

Field Name	Value Returned	Meaning
Media Type [b] **Note:** This field is not valid if the Full bit is not set. ▪ Media Type with Media Domain 43h (cleaning)	55h	Indicates a universal LTO cleaning cartridge.
	FEh	Indicates a universal TS11x0 technology cleaning cartridge.
	FFh	Indicates the media type cannot be determined.
▪ Media Type with Media Domain 4Ch (LTO)	31h	Indicates an LTO Generation 1 cartridge.
	32h	Indicates an LTO Generation 2 cartridge.
	33h	Indicates an LTO Generation 3 cartridge.
	34h	Indicates an LTO Generation 4 cartridge.
	35h	Indicates an LTO Generation 5 cartridge.
	36h	Indicates an LTO Generation 6 cartridge.
	FFh	Indicates the media type cannot be determined.
▪ Media Type with Media Domain 4Ah (TS11x0 technology)	43h	Indicates a TS1140 technology cartridge.
	44h	Indicates a TS110 technology cartridge.
	FFh	Indicates the media type cannot be determined.

a. The library only supports the first 16 characters of barcode data. If the barcode data is larger than 16 characters, only the first 16 characters are reported.

b. This field is omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen.

Storage Element Descriptor

Each magazine slot in the library is a storage element. For each storage element, the library returns the following storage element descriptor.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)			Element Address				
01								(LSB)
02	Reserved				Access	Except	RSVD	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							
06	Reserved							
07								
08								
09	SValid	Invert	Reserved					
10	(MSB)			Source Storage Element Address				
11								(LSB)
12 … 47	Primary Volume Tag Information (field omitted if PVolTag = 0)							
48 … 51	Reserved (field moved up if PVolTag = 0)							
52	Media Domain (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
53	Media Type (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
54 to 55	Reserved (00h, 00h) (field omitted if PVolTag = 0)							

Table 10-4: Parameter values for the Storage Element descriptor

Field Name	Value Returned	Meaning
Element Address	Varies [a]	Shows the address of the storage location (the cartridge slot).
Access	0	Indicates that the medium transport element cannot access the media at the storage location. This is possible when there is not a magazine in the specified location or the slot is reserved by the front panel. If the slot is reserved by the front panel, the Except bit will be set and the ASC and ASCQ values will be set to 80h, 18h.
	1	Indicates that the medium transport element can access the media at the storage location.
Except	0	Indicates that the storage element is in a normal state. Any data in the Additional Sense Code and Additional Sense Code Qualifier fields is invalid.
	1	Indicates that the storage element is in some sort of abnormal state or the element is reserved by the front panel for queued ejects. See Overview of T120 and T50e Entry/Exit Modes on page 73 for a description of queued ejects. More information on the nature of the exception is available in the Additional Sense Code and Additional Sense Code Qualifier fields.
Full	0	Indicates that the storage element does not contain media.
	1	Indicates that the storage element contains media.
Additional Sense Code (ASC)	Varies	The ASC and ASCQ together may provide more information about the condition which caused the Except bit to be set to 1. Their meaning here is the same as the ASC and ASCQ returned to the **REQUEST SENSE** command. For a listing of the meanings of all ASC-ASCQ combinations, see Appendix A – Error Reporting, beginning on page 96.
Additional Sense Code Qualifier (ASCQ)	Varies	
SValid (Source Valid)	0	Indicates that the value in the Source Storage Element Address field is not valid.
	1	Indicates that the value in the Source Storage Element Address field is valid.
Invert	0	The tape libraries do not support two-sided media and do not invert the media. This bit is always 0.
Source Storage Element Address	Varies [a]	Shows the storage element address where the media was previously located.
Primary Volume Tag Information	Varies [b]	▪ If the PVolTag bit in the data header is 1, this field contains the barcode label (volume tag) information for the media occupying this location. ▪ If the PVolTag bit is 0, this field is omitted entirely.

Table 10-4: Parameter values for the Storage Element descriptor

Field Name	Value Returned	Meaning
Media Domain [c] **Note:** This field is not valid if the Full bit is not set.	43h	Indicates that the element contains a cleaning cartridge.
	4Ch	Indicates that the element contains an LTO cartridge.
	4Ah	Indicates that the element contains a TS11x0 technology cartridge.
Media Type [c] **Note:** This field is not valid if the Full bit is not set. ▪ Media Type with Media Domain 43h (cleaning)	55h	Indicates a universal LTO cleaning cartridge.
	FEh	Indicates a universal TS11x0 technology cleaning cartridge.
	FFh	Indicates the media type cannot be determined.
▪ Media Type with Media Domain 4Ch (LTO)	31h	Indicates an LTO Generation 1 cartridge.
	32h	Indicates an LTO Generation 2 cartridge.
	33h	Indicates an LTO Generation 3 cartridge.
	34h	Indicates an LTO Generation 4 cartridge.
	35h	Indicates an LTO Generation 5 cartridge.
	36h	Indicates an LTO Generation 6 cartridge.
	FFh	Indicates the media type cannot be determined.
▪ Media Type with Media Domain 4Ah (TS11x0 technology)	43h	Indicates a TS1140 technology cartridge.
	44h	Indicates a TS1150 technology cartridge.
	FFh	Indicates the media type cannot be determined.

a. The Range of Values is supported by the MODE SELECT command.

b. The library only supports the first 16 characters of barcode data. If the barcode is larger than 16 characters, only the first 16 characters are reported.

c. This field is omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen.

Data Transfer Element Descriptor

The descriptor returned depends on whether DVCID is 0 or 1. For DVCID = 0, the library returns the following data transfer element descriptor for each drive installed.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)			Element Address				
01								(LSB)
02	Reserved				Access	Except	Reserved	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							
06	Obsolete	Reserved	Obsolete	Obsolete	Reserved	Obsolete		
07	Obsolete							
08	Reserved							
09	SValid	Invert	Reserved					
10	(MSB)			Source Storage Element Address				
11								(LSB)
12 ... 47	Primary Volume Tag Information (omitted if PVolTag = 0)							
48 ... 51	Reserved (field moved up if PVolTag = 0)							
52	Media Domain (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
53	Media Type (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
54	Drive Domain (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
55	Drive Type (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							

For DVCID = 1, the library returns the following data transfer element descriptor for each drive installed.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)	Element Address						
01								(LSB)
02	Reserved				Access	Except	Reserved	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							
06	Obsolete	Reserved	Obsolete	Obsolete	Reserved	Obsolete		
07	Obsolete							
08	Reserved							
09	SValid	Invert	Reserved					
10	(MSB)	Source Storage Element Address						
11								(LSB)
12 ... 47	Primary Volume Tag Information (omitted if PVolTag = 0)							
48	Reserved				Code Set (field moved up if PVolTag = 0)			
49	Reserved				Identifier Type (field moved up if PVolTag=0)			
50	Reserved (field moved up if PVolTag = 0)							
51	Identifier Length (1Eh) (field moved up if PVolTag = 0)							
52 ... 83	(MSB) Device Identifier (field moved up if PVolTag = 0) (LSB)							
84	Media Domain (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
85	Media Type (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
86	Drive Domain (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
87	Drive Type (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							

Table 10-5: Parameter values for the Data Transfer Element descriptor

Field Name	Value Returned	Meaning
Element Address	Varies [a]	Shows the address for the data transfer element (drive).
Access	0	Indicates that the medium transport element cannot access the drive.
	1	Indicates that the medium transport element can access the drive.
Except	0	Indicates that the drive is in a normal state. Any data in the Additional Sense Code and Additional Sense Code Qualifier fields is invalid.
	1	Indicates that the drive is in some sort of abnormal state. More information on the nature of the exception is available in the Additional Sense Code and Additional Sense Code Qualifier fields.
Full	0	Indicates that the drive does not contain media.
	1	Indicates that the drive contains media.
ASC ASCQ	Varies	The ASC and ASCQ together may provide more information about the condition which caused the Except bit to be set to 1. Their meaning here is the same as the ASC and ASCQ returned to the **REQUEST SENSE** command. For a listing of the meanings of all ASC-ASCQ combinations, see Appendix A – Error Reporting, beginning on page 96.
SValid (Source Valid)	0	Indicates that the value in the Source Storage Element Address field is not valid.
	1	Indicates that the value in the Source Storage Element Address field is valid.
Invert	0	The tape libraries do not support two-sided media and do not invert the media. This bit is always 0.
Source Storage Element Address	Varies [a]	Shows the storage element address from which the media was moved.
Primary Volume Tag Information	Varies [b]	▪ If the PVolTag bit in the data header is 1, this field contains the barcode label (volume tag) information for the media occupying this drive. ▪ If the PVolTag bit is 0, this field is omitted entirely.
CodeSet	0	When the DVCID = 0, the Identifier field is not valid.
	2	When DVCID = 1 and CodeSet = 2, the Identifier field (bytes 52 through 83) contains ASCII data.
Identifier Type	1	Indicates that it is a SCSI parallel interface which in this case is the drive serial number.

Table 10-5: Parameter values for the Data Transfer Element descriptor

Field Name	Value Returned	Meaning
Identifier Length [c]	00h	The drive identifier is omitted.
	1Gh	The drive identifier is 32 bytes in length.
Device Identifier	Varies [c]	The 32 byte null terminated ASCII representation of the drive serial number.
Media Domain [d] **Note:** This field is not valid if the Full bit is not set.	43h	Indicates that the element contains a cleaning cartridge.
	4Ch	Indicates that the element contains an LTO cartridge.
	4Ah	Indicates that the element contains a TS11x0 technology cartridge.
Media Type [d] **Note:** This field is not valid if the Full bit is not set. ▪ Media Type with Media Domain 43h (cleaning)	55h	Indicates a universal LTO cleaning cartridge.
	FEh	Indicates a universal TS11x0 technology cleaning cartridge.
	FFh	Indicates the media type cannot be determined.
▪ Media Type with Media Domain 4Ch (LTO)	31h	Indicates an LTO Generation 1 cartridge.
	32h	Indicates an LTO Generation 2 cartridge.
	33h	Indicates an LTO Generation 3 cartridge.
	34h	Indicates an LTO Generation 4 cartridge.
	35h	Indicates an LTO Generation 5 cartridge.
	36h	Indicates an LTO Generation 6 cartridge.
	FFh	Indicates the media type cannot be determined.
▪ Media Type with Media Domain 4Ah (TS11x0 technology)	43h	Indicates a TS1140 technology cartridge.
	44h	Indicates a TS1150 technology cartridge.
	FFh	Indicates the media type cannot be determined.
Drive Domain [d] **Note:** This field is not valid if the Full bit is not set.	4Ch	Indicates that the element contains an LTO drive.
	4Ah	Indicates that the element contains a TS11x0 technology drive.

Table 10-5: Parameter values for the Data Transfer Element descriptor

Field Name	Value Returned	Meaning
Drive Type [d] **Note:** This field is not valid if the Full bit is not set. ▪ Drive Type with Drive Domain 4Ch (LTO)	31h	Indicates an IBM LTO Generation 1 drive.
	33h	Indicates an HP LTO Generation 2 drive.
	34h	Indicates an IBM LTO Generation 2 drive.
	36h	Indicates an HP LTO Generation 3 drive.
	37h	Indicates an IBM LTO Generation 3 drive.
	3Ah	Indicates an IBM LTO Generation 4 drive.
	3Ch	Indicates an IBM LTO Generation 5 drive.
	3Eh	Indicates an IBM LTO Generation 6 drive.
	FFh	Indicates the drive type cannot be determined.
▪ Drive Type with Drive Domain 4Ah (TS11x0 technology)	43h	Indicates a TS1140 technology drive.
	44h	Indicates a TS1150 technology drive.
	FFh	Indicates the drive type cannot be determined.

a. Refer to Chapter 5 – Mode Select (15h), beginning on page 29 for information about the valid values for the element addresses.

b. The library only supports the first 16 characters of barcode data. If the barcode data is longer than 16 characters, only the first 16 characters are reported.

c. The identifier is omitted if DVCID (in the Read Element Status CDB) was set to 0 (as is shown by the 00h return for Identifier Length).

d. This field is omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen.

Import/Export Element Descriptor

The import/export element is used to import tape cartridges into or export tape cartridges from the library.

- For all tape libraries other than T120 and the T50e, the import/export elements are the slots assigned to the entry/exit pool for a partition. It is possible not to have any import/export elements assigned.

- For the T120 and the T50e, the import/export elements are the slots in the entry/exit port.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)			Element Address				
01								(LSB)
02	Reserved	CMC	InEnab	ExEnab	Access	Except	ImpExp	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							
06	Reserved							
07								
08								
09	SValid	Invert	Reserved					
10	(MSB)			Source Storage Element Address				
11								(LSB)
12 … 47	Primary Volume Tag Information (field omitted if PVolTag = 0)							
48	Reserved				Code Set			
49	Reserved				Identifier Type			
50	Reserved							
51	Identifier Length							
52	Media Domain (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
53	Media Type (field moved up if PVolTag = 0) (field omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen)							
54 to 55	Reserved (00h, 00h) (field omitted if PVolTag = 0)							

Table 10-6: Parameter values for the Import/Export element descriptor.

Field Name	Value Returned	Meaning
Element Address	Varies [a]	The address of the import/export element slot.
Access	0	The import/export element is not accessible by the picker.
	1	The import/export element is accessible by the picker.
CMC	0	Imports and exports are completed by an operator.
InEnab	0	The import/export element does not support movement of media into the location.
	1	The import/export element supports movement of media into the location.
ExEnab	0	The import/export element does not support movement of media out of the location.
	1	The import/export element supports movement of media out of the location.
Except	0	Indicates that the import/export element is in a normal state. Any data in the ASC and ASCQ fields is invalid.
	1	Indicates that the import/export element is in some sort of abnormal state. More information on the nature of the exception is available in the ASC and ASCQ fields.
ImpExp	0	Indicates that a tape is present in the import/export element and was put there by the medium transport element (the transporter).
	1	Indicates that media is present in the import/export element and was put there by an operator (import).
Full	0	Indicates that the import/export element does not contain media.
	1	Indicates that the import/export element contains media.
ASC	Varies	The ASC and ASCQ together provide more information about the condition that caused the Except bit to be set to 1. Their meaning here is the same as the ASC and ASCQ returned to the **REQUEST SENSE** command. See Appendix A – Error Reporting, beginning on page 96.
ASCQ	Varies	
SValid (Source Valid)	0	Indicates that the value in the Source Storage Element Address field is not valid.
	1	Indicates that the value in the Source Storage Element Address field is valid.
Invert	0	The tape libraries do not support two-sided media and do not invert the media. This bit is always 0.
Source Storage Element Address	Varies [a]	This field is the cartridge's last storage element address.

Table 10-6: Parameter values for the Import/Export element descriptor.

Field Name	Value Returned	Meaning
Primary Volume Tag Information	Varies [b]	▪ If the PVolTag bit in the data header is 1, this field contains the barcode label (volume tag) information for the media occupying this drive. ▪ If the PVolTag bit is 0, this field is omitted entirely.
CodeSet	0	The Identifier fields are not valid.
Identifier Length	0	No Identifier is returned.
Media Domain [c] **Note:** This field is not valid if the Full bit is not set.	43h	Indicates that the element contains a cleaning cartridge.
	4Ch	Indicates that the element contains an LTO cartridge.
	4Ah	Indicates that the element contains a TS11x0 technology cartridge.
Media Type [c] **Note:** This field is not valid if the Full bit is not set. ▪ Media Type with Media Domain 43h (cleaning)	55h	Indicates a universal LTO cleaning cartridge.
	FEh	Indicates a universal TS11x0 technology cleaning cartridge.
	FFh	Indicates the media type cannot be determined.
▪ Media Type with Media Domain 4Ch (LTO)	31h	Indicates an LTO Generation 1 cartridge.
	32h	Indicates an LTO Generation 2 cartridge.
	33h	Indicates an LTO Generation 3 cartridge.
	34h	Indicates an LTO Generation 4 cartridge.
	35h	Indicates an LTO Generation 5 cartridge.
	36h	Indicates an LTO Generation 6 cartridge.
	FFh	Indicates the media type cannot be determined.
▪ Media Type with Media Domain 4Ah (TS11x0 technology)	43h	Indicates a TS1140 technology cartridge.
	44h	Indicates a TS1150 technology cartridge.
	FFh	Indicates the media type cannot be determined.

a. See Chapter 6 – Mode Sense (1Ah), beginning on page 36 for range of values supported for element addresses.

b. The library only supports the first 16 characters of barcode data. If the barcode data is longer than 16 characters, only the first 16 characters are reported.

c. This field is omitted if **Include tape generation in Read Element Status** is not selected on the BlueScale Advanced Partition Setting screen.

Overview of T120 and T50e Entry/Exit Modes

The Entry/Exit mode determines how the Entry/Exit port (E/E port) operates. Entry/Exit modes are only applicable to the T120 and T50e libraries. The T120 supports Standard, Queued Eject, and Shared modes; while the T50e only supports the Standard and Queued Eject modes.

For additional information about the Entry/Exit modes, log on to the Support portal at http://support.spectralogic.com and read Knowledge Base article 469.

Standard Mode. When the Entry/Exit port is set to Standard mode, a single data partition "owns" the Entry/Exit port; additional data partitions cannot be configured. Both the T120 and the T50e support Standard mode. In Standard mode, the library's response to a **READ ELEMENT STATUS** command from the backup software indicates that it has eight slots (for a T120) or one slot (for a T50e) in the E/E port and that all of the slots are import-enabled, export-enabled, and accessible.

E/E Slot	Import-Enabled Bit (InEnab)	Export-Enabled Bit (ExEnab)	Access Bit	Full Bit
1	Always set (allows use for tape imports)	Always set (allows use for tape exports)	Is set (allows access by the backup software) if the E/E port is closed and cleared when the E/E port is open	Is set if a slot contains a tape, and cleared if a slot does not contain a tape
2				
3				
4				
5				
6				
7				
8				

The Full bit is set as appropriate, to indicate whether each slot has a cartridge in it. The backup software has full import/export access to these slots at any time. All moves are physical moves to and from the E/E port slots, so the number of cartridges that can be imported or exported by the software is limited by the physical capacity of the E/E port.

Shared Mode (T120 only). When the library is set to Shared mode, it allows two or more partitions in the library to share the E/E port. The library's response to a **READ ELEMENT STATUS** command from the backup software indicates that it has nine slots in the E/E port:

E/E Slot	Import-Enabled Bit (InEnab)	Export-Enabled Bit (ExEnab)	Access Bit	Full Bit
1	Always set (allows use for tape imports)	Always cleared (exports to this slot are not allowed)	Is set ONLY for the selected partition during import operations when the E/E port is closed	Is set if a slot contains a tape, and cleared if a slot does not contain a tape
2				
3				
4				
5				
6				
7				
8				
9	Always cleared (imports from this slot are not allowed)	Always set (allows use for tape exports)	Always set (allow access by the backup software)	Always cleared (the slot always appears empty)

- Slots 1 through 8 correspond to the physical slots in the E/E port and are import-only (the Import Enabled bit is set, but the Export Enabled bit is not). In addition, the slots have the Access bit cleared (access not allowed) until an import operation is initiated from the front panel of the library. When a front panel import operation is initiated for a partition, the Access bit for that partition is set, which enables access to the E/E port for import operations. The backup software can then use the E/E port to import cartridges into the partition.

  Note: The Access bit is only set for the partition for which the import operation is requested. The E/E port remains inaccessible for any other partitions configured in the library.

- In addition to the eight physical slots, the E/E port has an additional virtual slot (Slot 9), which is export-only (the Export Enabled bit is set, but the Import Enabled bit is not). For E/E Slot 9, the Access bit is always set, and the Full bit is always cleared. As a result, the response to an **READ ELEMENT STATUS** command indicates that Slot 9 is always empty and available for export operations.

  When the backup software exports a cartridge, the cartridge remains in its current storage slot. No physical move occurs, although the library reports that the move is complete. The Exception bit for the slot where the cartridge is located is set to indicate that the slot is in an "abnormal" state. Because the virtual export slot (Slot 9) never contains a cartridge, the library continues to report that the slot is empty and available for use, regardless of the number of cartridges that are exported using this method.

When an Eject Queued Tapes operation is requested from the front panel, the exported cartridges are physically moved to the eight slots in the E/E port so that they can be removed from the library. After the cartridges are removed, all of the Exception bits that were set for the storage slots are cleared and the Access bits are set, making those slots once again accessible to the backup software.

If the library is powered on with cartridges already in the E/E port, the cartridges are initially accessible by any partition (because the library does not know which partition should "own" them). In this case, selecting a partition and opening/closing the E/E port makes the cartridges accessible to the selected partition, just as with any import operation. A partition also gains ownership of the E/E port when you use the front panel to move cartridges to or from the E/E port.

Queued Eject Mode. Queued Ejects allow two or more partitions in the library to share the E/E port. Access to certain tapes and slots may be restricted and imports/exports may not be handled the way you may expect. Both the T120 and the T50e support Queued Eject mode. When the Entry/Exit port is set to Queued Eject mode, the library's response to a **READ ELEMENT STATUS** command from the backup software indicates that it has only one export-only E/E slot.

E/E Slot	Import-Enabled Bit (InEnab)	Export-Enabled Bit (ExEnab)	Access Bit	Full Bit
1	Always cleared (imports from this slot are not allowed)	Always set (allows use for tape exports)	Always set (allows access by the backup software)	Always cleared (the slot always appears empty)

The single E/E slot is functionally identical to the virtual E/E slot in Shared mode. As with Shared mode, the Exception bit is set and the Access bit cleared for any storage slots that contain cartridges that have been exported.

The BlueScale software treats all eject operations initiated by the backup software as logical moves to the E/E slot. The move is reported as successful, but the ejected cartridge is left in its original slot. The Exception bit for the slot is set for the storage slot and the Access bit for the slot is cleared, making the storage slot inaccessible to the backup software.

When an Eject Queued Tapes operation is requested from the front panel, the exported cartridges are physically moved to the single slot in a T50e or the eight slots in a T120 E/E port so that they can be removed from the library. After the cartridges are removed, all of the Exception bits that were set for the storage slots are cleared and the Access bits are set, making those slots once again accessible to the backup software.

Because the slot(s) in the E/E port are not import-enabled, the only way to import cartridges into a partition is by using either a move queue or a bulk load command from the library front panel. This type of import operation does not automatically update the cartridge inventory maintained by the backup software. You must force the software to re-inventory the partition after the import operation is complete to ensure that the inventory is accurate.

Command Status

The library returns a status byte after processing the **READ ELEMENT STATUS** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 14 – Reserve (16h), beginning on page 88 for more information about the **RESERVE** command.

Check Condition

The library returns Check Condition status for the following reasons:

- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 10-7 for sense data).

Table 10-7: Invalid parameters in the READ ELEMENT STATUS CDB

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	21h	01h	1	1	0	0	00 02h	Invalid starting element address.
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.
5h	24h	00	1	1	1	3h	00 01h	Invalid element type code.

Release (17h)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (17h)							
01	Obsolete [a]			3rdPty	Third Party Device ID			Element
02	Reservation ID							
03	Reserved							
04								
05	0	0	Reserved				0	0

a. These bits are ignored.

COMMAND DESCRIPTION

The **RELEASE** command enables the initiator to release reservations on the library or library elements that were set by the **RESERVE** (16h) command. For information on the **RESERVE** command, see Chapter 14 – Reserve (16h), beginning on page 88.

Only the initiator that reserved the library or its elements can release them. If another initiator attempts to release a reserved library or its elements, the library returns a Reservation Conflict status. Releasing an unreserved library or unreserved library elements is not an error.

WHAT YOU SEND TO THE LIBRARY

Table 11-1: RELEASE CDB field values

Field Name	Values Allowed	Meaning
3rdPty	0	**RELEASE** is not being requested for a third-party reservation.
	1	**RELEASE** is being requested for a reservation made previously by this initiator for the third-party device identified in the Third Party Device ID.
Third Party Device ID	0–7h	Shows the SCSI ID of the third-party device for which the library or some of its elements were previously reserved. This field is ignored if the 3rdPty bit is 0.
Element	0	The library releases all active reservations, for the entire unit or any of its elements, which came from this initiator (or were for the third-party device specified, if the 3rdPty bit is 1)
	1	The library releases the element reserved for this initiator with the matching Reservation ID. See Chapter 14 – Reserve (16h), beginning on page 88 for information about assigning Reservation ID numbers using the **RESERVE** command.
Reservation ID	Varies [a]	If the Element bit is 1, this field is checked to determine which elements to release. If the Element bit is 0, this field is ignored.

a. Any valid storage slot in the library reported by the MODE SENSE command. You cannot reserve an Import/Export, Medium Transport, or Data Transfer Element.

COMMAND STATUS

The library returns a status byte after processing the **RELEASE** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library never returns Reservation Conflict status for the **RELEASE** command.

Check Condition

The library returns Check Condition status for the following reasons:

- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 11-2 for sense data).

Table 11-2: Invalid parameters in the RELEASE CDB

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.
5h	24h	00	1	1	1	1h	00 01h	LongID field is set to 1.
5h	24h	00	1	1	1	1h	00 00h	Element field is set to 1.

CHAPTER 12

Report LUNs (A0h)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (A0h)							
01	Reserved							
...								
05								
06	(MSB)			Allocation Length				(LSB)
...								
09								
10	Reserved							
11	Control							

COMMAND DESCRIPTION (NOT SUPPORTED FOR PARALLEL SCSI LIBRARIES)

The **REPORT LUNS** command requests that the inventory of peripheral device logical units that are accessible to the initiator via the addressed SCSI target port be sent to the application client. The logical unit inventory is a list that includes the LUNs of all logical units having a Peripheral Qualifier value of 000b. Returning LUNs for logical units with Peripheral Qualifier values of 100b, 101b, 110b, or 111b is not supported.

The library supports a **REPORT LUNS** command when it is addressed to LUN zero. Support of the **REPORT LUNS** command by logical units other than logical unit zero is not supported.

Note: Devices compliant with SPC return a Check Condition status with sense key Illegal Request and additional sense data set to Invalid Field In CDB when the allocation length is less than 16 bytes.

The **REPORT LUNS** command returns Check Condition status only when the device server is unable to return the requested report of the logical unit inventory.

If a **REPORT LUNS** command is received from an initiator with a pending Unit Attention condition (that is, before the device server reports Check Condition status), the device server performs the **REPORT LUNS** command.

If the Unit Attention condition was established because of a change in the logical unit inventory, that Unit Attention condition is cleared for that initiator by the **REPORT LUNS** command. Unit Attention conditions established for other reasons are not cleared by the **REPORT LUNS** command.

The **REPORT LUNS** data should be returned even though the device server is not ready for other commands. The default report of the logical unit inventory should be available without incurring any media access delays. The default report of the logical unit inventory contains at least LUN 0.

If the logical unit inventory changes for any reason, including completion of initialization, removal of a logical unit, or creation of a logical unit, the device server generates a unit attention command for all initiators.

The device server sets the additional sense code to Reported LUNs Data Has Changed. The execution of a **REPORT LUNS** command to any valid and installed logical unit clears the Unit Attention condition that has a sense code of Reported LUNs Data Has Changed for all logical units of that target with respect to the requesting initiator. A valid and installed logical unit is one having a peripheral qualifier of 000b in the standard **INQUIRY** data.

WHAT THE LIBRARY RETURNS

The LUN List Length field contains the length in bytes of the LUN list that is available to be transferred. The LUN list length is the number of logical unit numbers in the logical unit inventory multiplied by eight. If the allocation length in the CDB is too small to transfer information about the entire logical unit inventory, the LUN list length value is not adjusted to reflect the truncation.

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (A0h)							
01	Reserved							
02								
03								
04	(MSB)			Allocation Length				(LSB)
05								
06								
07	Reserved							

LUN List

08 … 15	(MSB) First LUN (00) (LSB)							
16 … 23	(MSB) Second LUN (01) (LSB)							
N-7	(MSB)			Last LUN				(LSB)
N								

Spectra Logic libraries always report the LUNs sequentially, as illustrated in the following table.

Table 12-1: Examples of LUNs reported by a Spectra Logic library

LUNs	Configuration 1	Configuration 2	Configuration 3	Configuration 4	Configuration 5
0	Drive 1	**Library 1**	**Library 1**	**Library 1**	**Library 1**
1	Drive 2	Drive 1	Drive 1	Drive 1	**Library 2**
2	Drive 3	Drive 2	Drive 2	**Library 2**	
3	Drive 4	Drive 3	**Library 2**	Drive 1 (3)	
4		Drive 4	Drive 1 (3)		
5			Drive 2 (4)		

Configuration 1 The QIP only has drives attached.

Configuration 2 The QIP is an exporting library QIP and has drives attached.

Configuration 3 and Configuration 4 The QIP is exporting two separate partitions (virtual libraries).

Configuration 5 The RIM is exporting two separate partitions (virtual libraries).

Command Status

The library returns a status byte after processing the **REPORT LUNS** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 14 – Reserve (16h), beginning on page 88 for more information about the **RESERVE** command.

Check Condition

The library returns Check Condition status for the following reasons:

- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 12-2 for sense data).

Table 12-2: Invalid parameters in the READ ELEMENT STATUS CDB

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.
5h	24h	00	1	1	1	3h	00 01h	Invalid element type code.

Request Sense (03h)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (03h)							
01	Obsolete [a]			Reserved				
02	Reserved							
03								
04	Allocation Length							
05	0	0	Reserved				0	0

a. These bits are ignored.

COMMAND DESCRIPTION

The **REQUEST SENSE** command requests that the library transfer sense data to the initiator. It is generally issued immediately after the library reports a Check Condition status for the previous command.

WHAT YOU SEND TO THE LIBRARY

Allocation Length (byte 04) is the space allocated by the initiator for the sense data. The library returns a total of 52 bytes of sense data available to send. If you specify an Allocation Length greater than 52 bytes, the library sends 52. If you specify an Allocation Length less than 52 bytes, the library truncates the sense data at the specified Allocation Length.

COMMAND RESPONSE

The library returns the standard sense data, as described in the following table.

Bit Byte	7	6	5	4	3	2	1	0
00	Valid	Error code						
01	Segment Number 00h (not used)							
02	Reserved for other device types				Sense Key			
03	(MSB)	Information Bytes						
...								
06								(LSB)
07	Additional Sense Length = 2Ch							
08	(MSB)	Command Specific Information (not used)						
...								
11								(LSB)
12	Additional Sense Code (ASC)							
13	Additional Sense Code Qualifier (ASCQ)							
14	Field Replaceable Unit Code							
15	SKSV	(MSB)						
16	Command Specific Information (not used)							
17								(LSB)
18	ASCII Representation of Sense Data (not used)							
...								
51								

The sense data is valid for the Check Condition status just presented to the initiator. This sense data is preserved in the library for the initiator receiving the Check Condition status. Sense data is cleared when any subsequent command that is not a **REQUEST SENSE** or an **INQUIRY** (12h) command is received from the initiator.

Refer to Appendix A – Error Reporting, beginning on page 96 for a list and description of sense codes.

Table 13-1: Field values for the data returned by the REQUEST SENSE command

Field Name	Value Returned	Meaning
Valid	1b	Indicates the sense data conforms to the SPC-3 Standard.
Error Code	70h	Indicates the sense data is for the current error. The library does not perform deferred error reporting (error code 71h).
Segment Number	00h	This field is not implemented in the tape libraries.
Sense Key (General Error Category) See Appendix A – Error Reporting, beginning on page 96 for more information.	0h	**No Sense.** No specific sense information to report.
	2h	**Not Ready.** Indicates that the library cannot be accessed.
	4h	**Hardware Error.** The library detected a nonrecoverable hardware failure.
	5h	**Illegal Request.** There was an illegal parameter in the CDB or additional parameters supplied as data for some commands (for example, in **MODE SELECT**).
	6h	**Unit Attention**. The library's condition has somehow changed. For example, media may have been moved, or the unit may have been reset.
	9h	**Vendor-unique.** Sense information is specific to the tape libraries. The Additional Sense Code and Additional Sense Code Qualifier provide additional information.
Command Specific Information	0h	This field is not implemented in the tape libraries.
Additional Sense Length	2Ch	Indicates that 44 bytes (2Ch) of sense data follow this byte (52 total).
Additional Sense Code (ASC)	Varies	Provide further information about the nature of the error condition, beyond that reported in the Sense Key field. See Appendix A – Error Reporting, beginning on page 96 for descriptions of all ASCs and ASCQs that the library supports and how to interpret the values returned.
Additional Sense Code Qualifier (ASCQ)	Varies	
Field Replaceable Unit Code	00h	No specific unit failure has been identified.
SKSV	0b	Indicates the data in the Sense-Key Specific field is not valid. No sense-key specific information applies to the library.
ASCII Representation of Sense	Varies	This field is not implemented in the Spectra tape libraries.

COMMAND STATUS

The library returns a status byte after processing the **REQUEST SENSE** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

The library never returns Busy status for the **REQUEST SENSE** command.

Reservation Conflict

The library never returns Reservation Conflict status for the **REQUEST SENSE** command.

Check Condition

The library returns Check Condition status for the following reasons:

- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 13-2 for sense data).

Table 13-2: Invalid parameters in the READ ELEMENT STATUS CDB

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.

CHAPTER 14

Reserve (16h)

Bit / Byte	7	6	5	4	3	2	1	0
00	Operation Code (16h)							
01	Obsolete [a]							Element
02	Reservation ID							
03	(MSB)	Element List Length						
04								(LSB)
05	Control							

a. These bits are ignored.

COMMAND DESCRIPTION

The **RESERVE** command allows the initiator to reserve the library (partition) as a whole. Reserving the library prevents another user from moving media to the import/export element of the library using the library's touch screen control panel.

If the superseding reservation does not result in any reservation conflicts or error conditions, the library releases the previous reservation and completes the new reservations. A unit reservation of the library supersedes any previous element reservations by the same initiator.

The reserved library is released by issuing a **RELEASE** (17h) command from the same initiator, a bus device reset condition, a SCSI bus reset, or power-cycling the library.

WHAT YOU SEND THE LIBRARY

Table 14-1: RESERVE CDB parameter values

Field Name	Values Allowed	Meaning
Element	0	Requests reservation of entire library. If the library is reserved by another initiator, the library rejects this command with Reservation Conflict status.
Reservation ID	0	This field is only checked if the Element bit is set to 1. Because the Element bit is always set to 0, this field is ignored.
Element List Length	0	Because the library does not support reserving individual elements, the command is not followed by an element list.

COMMAND STATUS

The library returns a status byte after processing the **RESERVE** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when the library is reserved by a different initiator

Check Condition

The library returns Check Condition status for the following reasons:

- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB or element descriptor data is invalid (see Table 14-2 for sense data).

Table 14-2: Invalid parameters in the RESERVE CDB and element descriptor data

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	[a]	—	—	The value for a field in the CDB is invalid. The pointers indicate the field in error.

a. Value depends on which bit is wrong.

CHAPTER 15

Send Diagnostic (1Dh)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (1Dh)							
01	Obsolete [a]			PF	Reserved	SelfTest	DevOfL	UnitOfL
02	Reserved							
03	(MSB)	Parameter List Length						(LSB)
04								
05	0	0	Reserved				0	0

a. These bits are ignored.

COMMAND DESCRIPTION

The **SEND DIAGNOSTIC** command causes the library to perform its diagnostic self-tests or it causes the LCM to reset. Spectra tape libraries support the Default Self-Test (SelfTest bit = 1 and Parameter List Length = 0) and Reset LCM (PF=1, SelfTest bit = 1, and Parameter List Length = 8).

If a self-test or reset is successful, the library returns Good status; otherwise, it returns Check Condition status.

WHAT YOU SEND TO THE LIBRARY

Table 15-1: SEND DIAGNOSTIC CDB field values

Field Name	Values Allowed	Meaning
PF (Page Format)	0 or 1	0 for library self-test (SelfTest must be 1), 1 for LCM reset (SelfTest must be 0).
SelfTest	0 or 1	1 for library self-test (PF must be 0) 0 for LCM reset (PF must be 1).
DevOfL (Device Off-Line)	0	The library may not perform diagnostic tests whose results may be detected by subsequent I/O processes.
UnitOfL (Unit Off-Line)	0	The library may not perform diagnostic tests that might affect the the positioning of media inside the library.
Parameter List Length	0 - ffff	Specifies the length (in bytes) of the list to be transferred to the library. A length of 0 indicates that no data is to be transferred. This is not considered an error. For the Reset LCM diagnostic the data out length should be 8. For the Default Self-Test diagnostic this should be set to zero.

Send Diagnostic Assignment Page (Page Code 80h)

Bit / Byte	7	6	5	4	3	2	1	0
00	Page Code (80h)							
01	Reserved							
02	(MSB)			Page Length				
03				(00 04h)				(LSB)
04	(MSB)			Diagnostic ID				
05				(00 01h)				(LSB)
06	(MSB)			Reserved				
07								(LSB)

Table 15-2: Data sent on the Send Diagnostic Assignment page

Field Name	Value	Meaning
Page Code	08h	Identifies the Send Diagnostic Assignment page.
Page Length	00 04h	Indicates that there are an additional 4 bytes of element address data that follow this byte.
Diagnostic ID	00 01h	Indicates the Reset LCM diagnostic.

COMMAND RESPONSE

Because the library only supports the default self-test and LCM reset, there is no data returned from the **SEND DIAGNOSTIC** command. If the command is successful, a Good status is returned. Otherwise, a Check Condition status is returned. The sense information is available with a **REQUEST SENSE** command. Additional information may be returned in the ASC and ASCQ.

Check Condition

The library returns Check Condition status for the following reasons:

- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB or element descriptor data is invalid (see Table 15-3 for sense data).

Table 15-3: Invalid parameters in the SEND DIAGNOSTIC CDB and element descriptor data

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	a	—	—	The value for a field in the CDB is invalid. The pointers indicate the field in error.
5h	26h	00h	1	0	0	0	b	▪ Invalid values in the Parameter List Header. All values must be 0. The value of the field pointer is the value of the first field that contains a non-zero value (00, 01, 02, or 03). ▪ Invalid Parameter Length. ▪ Reserved bits set in the reserved fields 22 or 23 (bytes 18 or 19 of the Element Address Assignment page). ▪ Storage element addresses are not consecutive. ▪ Address wrap. Number of elements causes the address range to wrap back to 00 00.
5h	26h	00h	1	0	1	5h	a	Invalid Page Code.
5h	26h	00h	1	0	1	7h	a	Reserved bits set in the first byte of one of the **MODE SELECT** pages.

a. Value depends on which bit is wrong.
b. Field pointer depends on the order in which the pages are sent.

CHAPTER 16

Test Unit Ready (00h)

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code (00h)							
01	Obsolete [a]			Reserved				
02	Reserved							
...								
04								
05	0	0	Reserved				0	0

a. These bits are ignored.

COMMAND DESCRIPTION

The **TEST UNIT READY** command lets the initiator determine whether the library is ready to accept all other valid commands, including motion commands. This is not a request for a library self-test, which occurs at power-on.

COMMAND STATUS

The library returns a status byte after processing the **TEST UNIT READY** command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors. The library is ready to accept any valid command.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See for more information about the **RESERVE** command.

Check Condition

The library returns Check Condition status for the following reasons:

- A Unit Attention condition is pending for the initiator.

- The library is not ready because it has just powered up, it received a bus device reset message, or after a power-on reset. The sense key is set to Unit Attention (6h).

- The library has experienced an unrecoverable hardware error.

- A reserved bit is set to 1 in the CDB.

- A parameter in the CDB or parameter list is invalid (see Table for sense data).

Table 16-1: Invalid parameters in the TEST UNIT READY CDB and parameter list

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
2h	04h	00h	0	0	0	0	0	Unit not ready, manual intervention required.
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers indicate the bit in error.

APPENDIX A

Error Reporting

This appendix lists the Sense Keys, ASCs (Additional Sense Codes), and ASCQs (Additional Sense Code Qualifiers) for library errors. The ASCs and ASCQs are associated with the sense keys returned by the library in response to a **REQUEST SENSE** command (see Chapter 13 – Request Sense (03h), beginning on page 84). These three pieces of information combine to indicate a specific error condition.

> **Note:** For error codes returned by tape drives (medium errors), refer to the tape drive manual for that specific drive type. See Related Publications on page 10.

SENSE KEYS

The following table describes the sense keys returned by the library. The sense key provides a general indication of the type of error that occurred.

Sense Key	Meaning	Explanation
0h	No Sense	There is no specific sense key information.
2h	Not Ready	Library cannot be accessed. Operator intervention may be required to correct this condition. See the additional sense code description for more information.
4h	Hardware Error	Library detected a non-recoverable hardware failure while performing the command or during a self-test. See the ASC description for more information.
5h	Illegal Request	Invalid command request received or the library is in the wrong mode to process the command.
6h	Unit Attention	Indicates that the data cartridge inventory may have been changed.
9h	Vendor Specific	Indicates vendor-specific sense data for tape libraries.

Sense Keys Not Used

The libraries *do not* use the following sense keys:

Sense Key	Meaning
1h	Recovered Error
3h	Medium Error
7h	Data Protect
8h	Blank Check
Ah	Copy Aborted
Bh	Aborted Command
Ch	Equal
Dh	Volume Overflow
Eh	Miscompare

ADDITIONAL SENSE CODES AND QUALIFIERS

Combining the Sense Key with the Additional Sense Code (ASC) and Additional Sense Code Qualifier (ASCQ) returned in response to a **REQUEST SENSE** command, provides the most complete error description available from the library. The following table describes the ASC/ASCQ associated with each sense key returned by the library. The error descriptions are listed in order by ASC and ASCQ for each of the sense keys.

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
0h No Sense	00h	00h	Unit ready.	No problems; no additional sense information.
2h Not Ready	04h	00h	Unit not ready.	The unit is not yet ready to accept commands.
	04h	01h	Unit is becoming ready.	The unit is in the process of becoming ready.
	04h	03h	Unit NOT Ready, Manual Intervention Required.	The library has a hardware issue that must be manually resolved. Manually resolve the hardware issue.
	04h	83h	Door is open, robot disabled.	Close the door.

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
4h Hardware Errors	05h	00h	Logical unit does not respond; device is permanently inaccessible.	This is returned by the Fibre-SCSI bridge only when the library claims the presence of a tape drive that cannot be found on the internal SCSI bus, and for which inquiry data cannot be obtained. These tape drives appear to the host, but any attempts to access them returns this error.
	2Eh	01h	Third party device failure. There are problems communicating with the third party device.	Check the sense codes returned from the third party device to determine the problem. Correct the problem before attempting to communicate with the device again.
	2Eh	02h	Copy target device is unreachable. The target device specified is invalid.	Verify that the specified target device is correct. Also verify that the device is powered on and ready.
	2Eh	04h	Copy target device data under-run.	This code is reserved and represents an internal error that should not occur. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	2Eh	05h	Copy target device data overrun.	This code is reserved and represents an internal error that should not occur. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	40h	D1h	Import/export door could not be extended.	Check door for obstruction.
	40h	D2h	Import/export door could not be retracted.	Check door for obstruction.
	4Ch	00h	Unit failed initialization.	Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	81h	01h	Drive failed to unload.	Retry the move. Tape may be stuck in drive.
	81h	02h	Tape failed load; move marked successful.	Drive, tape, or tape sensor may be bad.
	81h	04h	Drive failed to come ready.	The tape may be broken or is a cleaning tape, or the drive may be broken.

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
4h Hardware Errors *(continued)*	85h	01h	Move failed; tape left in picker.	The robotic picker may have lost its calibration, or there were obstructions at both the source and destination slot. Manually remove the tape from the picker's jaws and recalibrate the robot. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	85h	02h	Move failed; tape left in source.	Retry the move.
	85h	03h	Move failed; picker will reset.	Retry the move after reset.
	85h	04h	Long axis motor blocked.	Remove obstruction and cycle power.
	85h	05h	Gripper motor blocked.	Remove obstruction and cycle power.
	85h	06h	Rotary motor blocked.	Remove obstruction and cycle power.
	85h	07h	Medium axis motor blocked.	Remove obstruction and cycle power.
	85h	08h	Short axis motor blocked.	Remove obstruction and cycle power.
	85h	09h	Parameter block is corrupted.	Erase parameter block and cycle power.
	85h	0Ah	Picker failed to park.	Check for obstruction beneath picker.
	85h	0Bh	Picker failed initialization— cannot communicate with barcode scanner.	The barcode scanner is essential for robotic operation, so the picker fails initialization if it cannot communicate with it. The picker needs to be power cycled. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
4h Hardware Errors *(continued)*	85h	0Eh	Cartridge stuck in slot; the robotic picker was unable to pull the tape from the source.	There may a problem with the picker's alignment, the tape, or the magazine. 1. Retry the operation and watch as the picker attempts to grab the tape. Is the picker properly aligned? 2. If that fails, manually remove the tape from the slot. 3. If that fails, try to reseat the magazine. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	85h	25h	Cartridge stuck in drive; the robot was unable to remove the tape from the drive. (The tape is usually left in the mouth of the drive.)	The robot may be misaligned or the tape may be broken (with the tape possibly wrapped around the drive heads). 1. Re-issue the command, either from the front panel or the software. 2. If that fails, remove the drive, being careful of the tape position so that it clears the metal parts of the library when you pull the drive out. CAREFULLY try to remove the tape from the drive manually; do NOT force it. If you cannot remove the tape from the drive, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4) to arrange for an RMA drive replacement. 3. If the tape was not sitting in the mouth of the drive and re-issuing the command did not work, reseat the drive and again re-issue the command. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	85h	90h	No mechanical picker version defined.	Run diagnostic to set picker version from front panel.

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
4h Hardware Errors *(continued)*	85h	91h	Calibration block not found.	Check for obstruction in base of unit and cycle power to retry.
	85h	92h	No rack version defined.	Run Diagnostic Check to set rack version from front panel.
	85h	99h	General robotics failure.	The library has a unknown hardware error. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	86h	00h	Fibre failed initialization.	Unplug and replug the F-QIP or RIM.
	87h	00h	Invalid FPROM / invalid ID bits.	Bad FPROM, Check 12V or invalid device.
	87h	01h	FPROM ERASE operation failed.	Bad FPROM, Check 12V or invalid device.
	87h	02h	FPROM write operation failed.	Bad FPROM, Check 12V or invalid device.
	88h	00h	General picker definition error.	General picker definition error.
	88h	01h	Invalid picker type.	The picker type is invalid.
	88h	02h	Invalid rack type.	The rack type is invalid.
	88h	03h	Invalid library size.	The library size is invalid.
	88h	04h	Invalid chassis type.	The chassis type is invalid.
	88h	05h	Invalid IE door type.	The IE door type is invalid.
	90h	00h	Internal SCSI error unknown.	Reset the F-QIP or RIM and retry the operation. You may also have to reboot the server. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	90h	01h	Internal SCSI command failed.	
	90h	02h	SCSI command timed out.	Check device power and cables. Reset the drive. Go to the Status screen and then to the Drive screen to see if the library shows a problem with the drive.
	90h	03h	Internal SCSI command was aborted by host.	Reset the F-QIP or RIM and retry the operation. You may also have to reboot the server.

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
4h Hardware Errors *(continued)*	90h	04h	Initiator detected Error Message Received.	Reset the F-QIP or RIM and retry the operation. You may also have to reboot the server. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	90h	05h	Internal SCSI command reselect timeout.	
	91h	XXh	Internal SCSI chip failure.	
	92h	00h	Unknown error on internal SCSI chip.	
	92h	01h	Internal SCSI port does not exist.	
	92h	02h	Internal SCSI port is non-functional.	
	92h	03h	Internal SCSI port is disabled.	
	92h	04h	Interface hardware is not supported.	
	92h	05h	Requested data transfer length is too long.	The data transfer length for any single command is limited by the total buffer space available (between 4 and 16 MB). Reset the F-QIP or RIM and retry the operation. You may also have to reboot the server. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	06h	DMA error.	Reset the F-QIP or RIM and retry the operation. You may also have to reboot the server. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	07h	Command phase overrun—device demanded more CDB bytes than available.	
	92h	08h	Device supplied excess status bytes.	
	92h	09h	Device did not complete command with Command Complete.	
	92h	0Ah	Device skipped MSG OUT phase after Selection.	
	92h	0Bh	Device rejected extended ID message.	

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
4h Hardware Errors *(continued)*	92h	0Ch	Device rejected Initiator Detected Error message.	Reset the F-QIP or RIM and retry the operation. You may also have to reboot the server. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	0Dh	Device rejected Abort message.	
	92h	0Eh	Device rejected Reject message.	
	92h	0Fh	Device rejected NOOP message.	
	92h	10h	Device rejected Parity Error message.	
	92h	11h	Device rejected Bus Device Reset message.	
	92h	12h	Device rejected Identify message.	
	92h	13h	Device went to Bus Free illegally.	
	92h	14h	Device skipped a phase illegally.	
	92h	15h	Device did not return GOOD status to automatic **REQUEST SENSE**.	
	92h	16h	Queued command requested without disconnect privilege.	This error code is reserved and represents an internal error that should not occur. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	17h	Queued command requested to a target routine.	
	92h	18h	Queued command requested with queuing disabled.	
	92h	19h	Bad IOQB entry submitted to hardware.	This error code is reserved and represents an internal error that should not occur. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	1Ah	Device does not respond—it is powered off, not attached, or non-functional.	Reset the F-QIP or RIM and retry the operation. You may also have to reboot the server. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
4h Hardware Errors *(continued)*	92h	1Bh	Interface command queue is full.	This error code is reserved and represents an internal error that should not occur. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	1Ch	Device operation did not complete for unknown reason.	Reset the F-QIP or RIM and retry the operation. You may also have to reboot the server. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	1Dh	Device operation was aborted.	
	92h	1Eh	Device operation was aborted with a Bus Device Reset.	
	92h	1Fh	Device operation was aborted with a BUS RESET.	
	92h	20h	Device operation timed out.	This error code is reserved and represents an internal error that should not occur. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	21h	Device operation failed with a parity error.	Reset the F-QIP or RIM and retry the operation. You may also have to reboot the server. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	22h	Device operation failed because device never logged in.	This applies only to Fibre Channel initiator interfaces attempting to talk to Fibre Channel targets. Reset the F-QIP or RIM and retry the operation. You may have to reboot the server. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	23h	Device operation failed because device logged out.	
	92h	24h	Device operation failed because device logged in again.	
	92h	25h	Internal control function resulted in error.	This error code is reserved and represents an internal error that should not occur. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
4h Hardware Errors *(continued)*	92h	26h	CAN sequence error.	This represents an internal error that should not occur when the fibre side of the bridge is communicating with the SCSI side. 1. Verify that all library modules are secured to the library frame. 2. If attempting to load code to the QIP or RIM, verify that no external connected systems are trying to communicate with the QIP or RIM. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	27h	Data overrun sequence error.	The command issued had either the wrong data length or an incorrect value for its length. Issuing a SCSI WRITE command with no data also produces this error. Verify that the command being issued is valid. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	92h	28h	Data under-run sequence error.	
	92h	29h	Command under-run sequence error.	The command issued had either the wrong CDB length or an incorrect value for its length. Issuing a SCSI WRITE command with no data also produces this error. Verify that the command being issued is valid. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	99h	01h	Invalid CAN command during code load.	Restart code load.
	99h	02h	Invalid CAN address during code load.	
	99h	03h	Invalid CAN from address during code load.	
	99h	04h	Invalid CAN sequence during code load.	
	99h	05h	Checksum failed during code load.	

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
4h Hardware Errors *(continued)*	99h	06h	Repeated sequence during code load.	Code load continues.
	99h	07h	Frame error during code load.	
	99h	08h	Burn code to flash failed.	Restart code load.
5h Illegal Request	00h	16h	Operation in progress. The initiator is trying to initiate an additional command to the target device before the first command is complete.	The initiator cannot send more than one tape movement command at a time. **1.** Wait for the previous command to complete. **2.** Stop all software and reset the devices involved. **3.** Verify connectivity of the device before proceeding. **4.** Power cycle the device to stop the error; also stop and restart the program, daemon, or services involved.
	1Ah	00h	Parameter list length error.	The number of SCSI mode parameters passed differs from the number required.
	20h	00h	Invalid command code.	The command code received is not supported or not a valid command. Verify that the attempted command is supported, then retry the command.
	21h	01h	Invalid element address.	The command contained an invalid element address for this logical library.
	24h	00h	Invalid field in CDB.	A field in the command descriptor block was not a valid value.
	25h	00h	LUN not supported.	The requested logical unit is not supported.
	26h	00h	Invalid field in parameter list.	A parameter field was sent with an invalid value.
	26h	01h	Parameter not supported.	The parameter in the SCSI CDB is not supported. Verify that the command issued is a valid command.

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
5h Illegal Request *(continued)*	26h	02h	Parameter value invalid.	A parameter in the CDB has a value that is out of range. Verify that the command issued is a valid command.
	26h	06h	Too many target descriptors.	Verify that the command issued is a valid command.
	26h	07h	Unsupported target descriptor type code.	Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	26h	08h	Too many segment descriptors.	
	26h	09h	Unsupported segment descriptor type code.	Verify that the command issued is a valid command.
	26h	0Ah	Unexpected inexact segment.	
	26h	0Bh	Inline data length exceeded.	This code is reserved and represents an internal error that should not occur. Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	26h	0Ch	Invalid operation for copy source or destination.	
	2Ch	00h	Command sequence error. FLASH code download to tape drive via Write Buffer failed.	
	2Eh	03h	Incorrect copy target device type.	Verify the device type of the target device. Also verify the device type being reported by the target device. Only disk and tape are supported devices.
	39h	00h	An attempt was made to save an emulated mode page; saving parameters not supported.	The current command is invalid. Use a valid command.
	3Bh	0Dh	Medium destination is full.	The destination element is full or there is an inventory sensor problem.
	3Bh	0Eh	Medium source element empty.	The source element is empty or there is an inventory sensor problem.
	3Bh	11h	Media magazine not accessible.	The slot location does not contain a magazine. This will only occur in libraries with TeraPack magazines.
	3Dh	00h	Identify message error.	The Identify message had invalid bits set in the message.

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
5h Illegal Request (continued)	3Dh	80h	Disconnects must be allowed.	The host must allow SCSI disconnects for this command to complete.
	49h	00h	An attempt was made to issue an ACA Queue command.	The current command is invalid. Use a valid command.
	53h	02h	Media removal prevented.	Another initiator has prevented media from being removed from the library.
	80h	00h	Generic invalid move.	Move is invalid, reason not reportable.
	80h	01h	Picker not empty.	Remove the tape.
	80h	03h	Source magazine not available.	Install/configure magazine.
	80h	04h	Destination magazine not available.	
	80h	05h	Source drive is not available.	Install/configure drive.
	80h	06h	Destination drive is not available.	Install/configure drive.
	80h	07h	The medium source is invalid; no barcode label was detected by the robotic picker.	This error occurs when there are no barcoded tapes in the TAP when running the Picker Slot Calibration Long Axis Test. This test requires at least one barcoded tape in the TAP (any slot) for the diagnostic test to run.
	80h	18h	Element is reserved for front panel.	This occurs when the slot is reserved by the front panel for queued ejects. See Overview of T120 and T50e Entry/Exit Modes on page 73. Re-issue command after the reservation is cancelled.
	81h	00h	Duplicate SCSI ID on this bus.	All SCSI IDs on a SCSI bus must be unique. Verify the SCSI ID's of all devices. The host system bus may have to be rebooted/reset for the new ID to be accessible.

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
5h Illegal Request *(continued)*	81h	01h	TAP is Exit Only.	With Queued Unloads enabled, the TAP is Exit Only. It can export tapes but not import them. **1.** If you want to use the software to import tapes from the TAP to the storage slots, you must disable the Queued Unloads option. **2.** In a multi-partition library, you must manually load the tapes, using the front panel Library Controller for single-tape or bulk loading.
	81h	02h	Library is full of tapes; no more tapes may be loaded.	Unload tapes from the library and retry the operation.
	81h	03h	Cannot move tape from drive to TAP with Queued Unloads enabled.	This error is reported if the software attempts to move a tape from a drive to the TAP when Queued Unloads is enabled AND when the source slot is not an actual storage slot. Possible initial source slot moves that cause this error include moving a tape to a drive from the TAP, or moving a tape from another drive and then having the software attempt to move the tape to the TAP. If you moved a tape from a slot to a drive and then have the software move the tape to the TAP, the tape is unloaded and moved to its original slot, and then set for Queued Unloads.
	81h	10h	Unable to insert tape. The TAP is Exit Only.	Disable the Queued Unload option and retry the move.
	89h	24h	Library is full of tapes.	Remove some tapes so the drives can be unloaded.
6h Unit Attention	28h	00h	Inventory possibly altered.	The library's inventory may have been altered by another initiator.
	28h	01h	Door element accessed.	A tape was moved to or from the TAP.
	29h	00h	A reset has occurred.	The library has been reset or powered on.

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
6h Unit Attention *(continued)*	29h	80h	Drive failed power-on self test (POST) or user issued diagnostic test. This is a Sony-unique error code.	1. Power cycle the tape drive. (Open the library door, pull and reseat the drive, then close the library door and wait for the robot to fully initialize.) 2. Select the Status button from the main screen of the Library Controller. If the problem persists, contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	2Ah	01h	Mode parameters have changed.	The library's mode parameters have been modified.
	2Fh	00h	Commands aborted; cleared by another initiator.	Contact Spectra Logic Technical Support (see Contacting Spectra Logic on page 4).
	3Fh	01h	New firmware was loaded successfully.	The library's inquiry data has changed. Treat the library as a new device. A full device discovery from the host side may be necessary. Some backup software does not handle firmware upgrades very well. Consult with your backup software vendor.
	3Fh	03h	The device's inquiry data has changed. A new tape library inquiry data was configured for the device.	It is possible that the device has been hot-swapped or that a new configuration has been saved. Treat this as a new device. A full device discovery from the host side may be necessary. Some backup software does not handle hot-swapping of devices very well. Consult with your backup software vendor.

Sense Key	ASC	ASCQ	Error Description	Explanation or Error Remedy
9h Vendor-Specific	83h	00h	Barcode label is unread.	Reading this barcode label has not yet been attempted.
	83h	01h	Problem reading barcode label.	This barcode label could not be read.
	83h	02h	Tape is queued for unload.	This tape can only be moved by the front panel.
	84h	01h	No response from SCSI target.	SCSI target failed to respond. Check SCSI bus connections and device power.
	84h	02h	Check unexpected condition from target.	Serial SCSI command failed. Issue a **REQUEST SENSE** and examine the SCSI sense data to find the cause.

INDEX

V

W